PERFORMANCE PHASE PLANNING GUIDE

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USAF TEST PILOT SCHOOL
EDWARDS AFB, CALIFORNIA

This Performance Phase Planning Guide has been reviewed and approved.

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INTRODUCTION

This booklet is designed to serve as a planning guide for students during the Performance Phase of the TPS curriculum and should be considered as the most current source of correct information. This phase lasts approximately 12 weeks and is designed to give each student appropriate academics and experience in performance flight testing. The flying program consists of demonstration flights in which specific Flight Test Techniques (FTT) are demonstrated by the instructor pilot, student FTT practice flights, and data missions to gather data for performance evaluation reports.

Performance testing ideally consists of two primary phases. Phase I consists of aircraft modeling, while Phase II involves performance testing/verification. Figure 1 presents this idealized process.

Due to the compressed nature of the USAF TPS curriculum, and academic/flying constraints, student training during the Performance Phase differs slightly from real world performance flight test. Figure 2 shows how each academic class, FTT, demo/practice/data flight is integrated into the phase schedule.

DATA GROUP ORGANIZATION

During the Performance Phase, the class will be divided into test team data groups consisting of pilots and flight test engineers/navigators (FTE/N). Each test team will be given a test plan requiring a limited performance evaluation of its respective aircraft. During the performance flight testing phase, the test team leader will supervise the entire test team's effort to pool all the data from each flight for the purpose of the final report.

In-flight acquisition of data and subsequent reduction/interpretation as a pilot and FTE/N team are an important part of student training. Computer data reduction procedures will be covered in classroom lectures. <u>Each student pilot and FTE/N is responsible for reducing the data from his/her particular mission</u>. If usable data are not obtained from a mission, notify the Performance Branch Chief to determine if a backup flight is required.

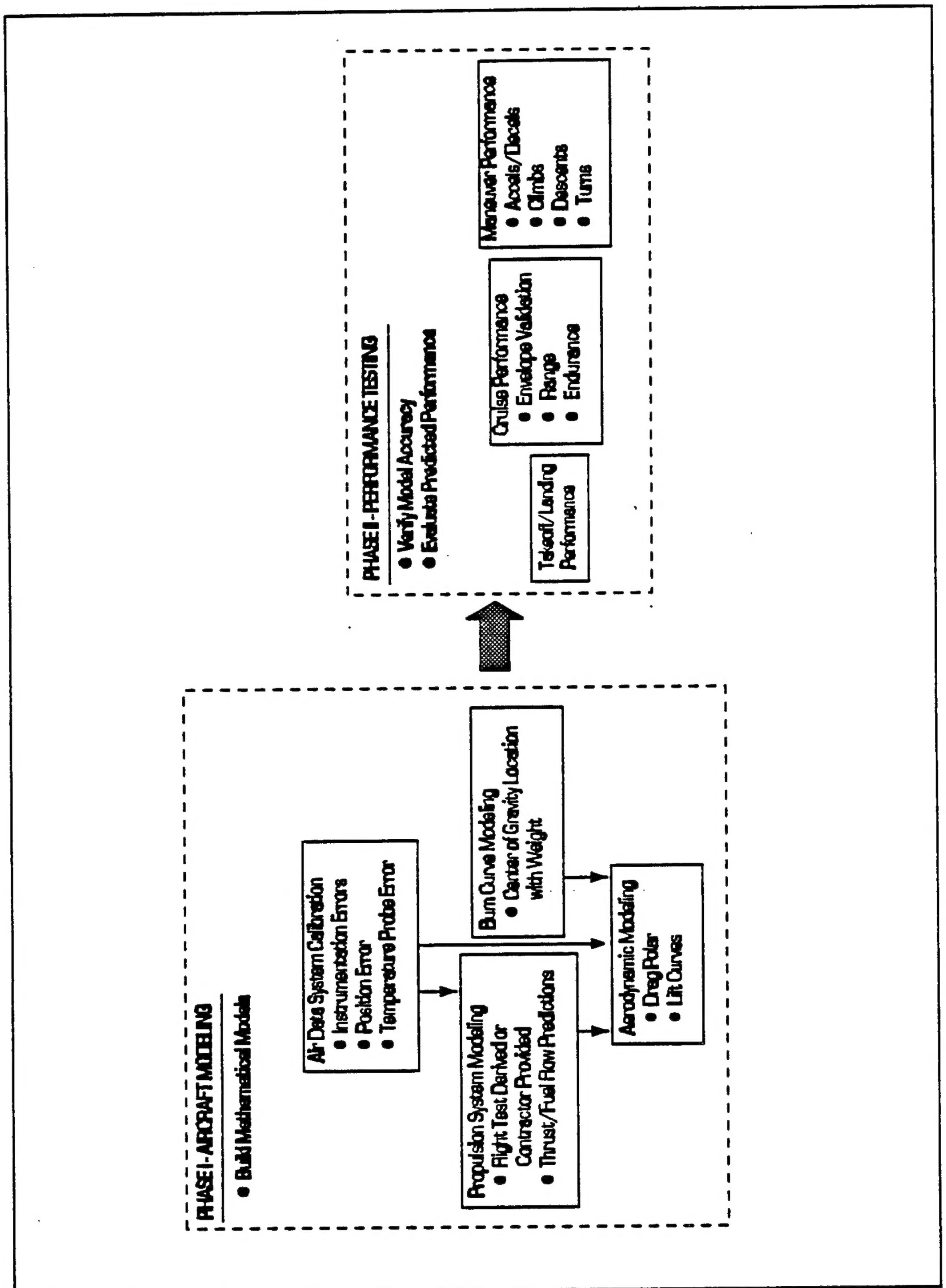

Figure 1 Aircraft Performance Testing

	ACADEMICS		FLYING		
Subject	**Theory/Flight Test Courses**	**FTT**	**Demo**	**Practice**	**Data**
Basic Aerodynamics	• Subsonic Aero • Supersonic Aero	N/A	N/A	N/A	N/A
Takeoff/Landing Performance	• Takeoff and Landing	• Takeoff Data	N/A	N/A	(TAKEOFF DATA)*
Air Data System Calibration	• Pitot-Statics	• Tower Flyby Pace/Radar	Pilots: Tower Flyby	N/A	• Tower Flyby • Pace/Radar
Maneuver Performance	• Energy	• Level Accel/Sawtooth Climbs • Check Climb/Descent/Turn Performance	FTE/N: Level Accel/Turn Perf (C-23) Pilots: Level Accel/Sawtooth Climbs & Check Climb/Descent/Turn Perf	• Level Accel/Sawtooth Climbs • Turn Perf	• Level Accel/Sawtooth Climbs • Turn Perf (CHECK CLIMB/DESCENT)*
Aerodynamic Modeling	• Equations of Motion I • Aerodynamic Modeling	• Aerodynamic Modeling (Stabilized/Dynamic/Engine Out Methods)	Pilots and C141Gp FTE/N: Aerodynamic Modeling	• Aerodynamic Modeling	• Aerodynamic Modeling
Cruise Performance	• Cruise	• Cruise	N/A	N/A	• Cruise
Propulsion System Performance	• Propulsion	• Propulsion	Pilots: Propulsion	N/A	N/A
Other	• Hypersonic Aero	• Low L/D • High L/D	• Low L/D • High L/D		N/A

* done in conjunction with other data sorties

Figure 2 Performance Phase Flow

BRIEFING/DEBRIEFING

It is the responsibility of the student to contact the instructor pilot to schedule flight briefings. Briefing and debriefing items for each flight are specified in this planning guide. In general, it is the responsibility of the student to brief the entire flight, including mission profile, sequence of data points, possible deviations, and safety considerations. The instructor pilot will expand on or correct the above items and brief flight test techniques to be demonstrated on the flight. Approved AFFTC briefing guides will be used. For those missions where the pilot and FTE/N brief as a team, the pilot should brief the general portion of the briefing, and the FTE/N should brief the specific data mission information.

Debriefings by the pilot or FTE/N should emphasize data anomalies, periods of bad data, and qualitative comments. The objective is to exercise your powers of observation. Get in the habit of commenting on and recording anything you consider unusual or interesting. Seemingly insignificant items could become important later.

DATA FLIGHTS

Student data flights are used to gather data for the Limited Performance Evaluation report described in the Technical Reports section of the USAF TPS Test Management Phase Planning Guide. All data flights are covered by the aircraft specific USAF TPS Limited Performance Evaluation Test Plan, which defines data points, limitations, and safety considerations. Deviations from the test plan are not authorized without the approval of the Performance Branch Chief.

Test points for a particular data flight will be assigned by the test team leader from the test conditions given in the test plan. On all data flights, the student will accomplish the following mission events:

a. Flight Preparation. Prepare all flight and data cards and plan the sequence of events.

b. Briefing. Pilots will insure that the flight card is initialed by an instructor pilot current in the appropriate aircraft.

c. Ground Block. Perform a performance ground block at the parking ramp. Set altimeter to 29.92 inches Hg.; approaching from both above and below, record the indicated altitude (H_i). Record the indicated velocity (V_i), the indicated temperature (T_i), g-meter reading, vertical velocity (VVI), time of day (TOD), location, instrument serial numbers, pressure altitude, winds, and runway temperature. Run the Data Acquisition System (DAS) for approximately 10 seconds, or as required, using the

voice track to record pertinent mission data to allow proper tracking of the specific data flight during post flight analysis.

d. Takeoff. See Takeoff Data (Section IV). Record takeoff data on all flights in your data group aircraft.

e. Climb. See Check Climb Data (Section IV). If practical, a check climb should be performed on every data mission.

f. Data. See applicable data mission (Section IV).

g. Descent. See Check Descent Data (Section IV). If practical, a check descent should be performed on every data mission.

h. Landing. No landing data are required to be taken.

i. Debriefing. Be sure to inform your team leader of which test points need to be repeated.

It is highly recommended that the AFSC Form 5314 Daily/Initial Flight Test Report be used to record dates, objectives, flight times, and observations. This documentation will be required during later phases of the curriculum and is useful for mission analysis at later dates.

FLIGHT TEST TECHNIQUES (FTT)

FTT practice missions, in addition to those formally required, may be scheduled when aircraft availability permits. Students will plan the flight profiles for these missions and have the flight cards approved by an instructor pilot current in the applicable aircraft. You may practice any FTT in which you have previously received formal instruction. Generic FTT flight profiles are provided in Section IV for use in planning these sorties. Touch and go landings may be performed on FTT or data missions if fuel permits.

GRADING

The USAF Test Pilot School grades various items throughout the curriculum to provide both instructors and students feedback on training quality. Flying, academics, and reports are graded using numerical, pass/fail, and excellent/good/fair/unsat ratings depending on the particular training involved.

During the performance phase, numerical flying grades will be given on the FTT Mid-Phase Check (pilots only), and on the Performance FTT Final Check (pilots and FTE/Ns). These grades will be based on the following overall criteria:

a. Planning. Thorough pre-flight and in-flight planning are essential to good flight testing.

b. Briefing and Debriefing. It is the student's responsibility to completely brief and debrief the mission.

c. Data. The data must be valid and reliable. Any invalid data should be noted as such. It is better to properly identify poor data and repeat the test points at a later time than to incorporate the bad data into technical reports/flight manuals/aircrew procedures/etc.

d. Energy and Time Management. Optimum use must be made of available fuel, time, and energy.

Other FTT demo flights (day-to-day instructional sorties) are graded using excellent/good/fair/unsat ratings.

Academic activity is evaluated as per the Performance Phase Course Objectives.

Report requirements/grading is presented in Section III of this document, Section III of the Test Management Phase Planning Guide, and the aircraft specific test plans.

Grading standards and criteria are contained in USAF Test Pilot School Operating Instruction 53-5. **Do not get hung up on the grades or the grading process! Grades are simply a tool in the USAF TPS training process. Do your best, work hard, and above all, keep a good attitude. What you get out of the program depends on what you put into it!**

CONCLUSION

A major factor in the success or failure of a test mission is preflight planning. However, the order in which various phases of a flight are carried out will often be changed by local conditions and, therefore, may be changed as the student sees fit on student data missions. It is important that the test team learn to be flexible so that the mission plan may be modified in flight when dictated by changing conditions. To obtain maximum value from the flying course, a suggested procedure for the student to follow is:

a. Before each Flight Test Technique (FTT) lecture, review the applicable theory in the course textbooks.

b. Read the applicable portions of this planning guide.

c. Before planning your data flight (either with an instructor or with another student), again review this planning guide and the USAF TPS Limited Performance Evaluation Test Plan applicable to your aircraft.

d. Plan the flight and make up data cards, using this planning guide, the aircraft flight manual, the test plan, and all applicable safety documentation. It is strongly recommended that this be done as soon as possible after the FTT lecture.

e. When the flight appears on the daily schedule, review the mission and complete all planning details. Since this review should require only an hour at most, all students should be prepared to take the mission on short notice.

f. Accomplish data reduction and plot the data as soon as possible after the flight is complete.

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SECTION II
LIMITATIONS

Aircraft limitations as set forth in the applicable aircraft flight manuals and performance manuals will not be exceeded. Additionally, all pilots will become familiar with Class II modifications (instrumentation, switch and/or flight instrument changes, etc.) and associated limits that apply to many of the USAF Test Pilot School airplanes as specified in the appropriate partial flight manuals. The Air Force Flight Test Center (AFFTC) Test Project Safety Review (AFSC 5028) package is located in Appendix B; applicable portions of the 5028s will be reviewed during mission briefings. All restrictions and limitations listed throughout this phase planning guide will be adhered to.

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SECTION III
REPORTS

Four major written reports are required during the performance phase of TPS:

1. Air Data Calibration (group, technical letter, pass/fail).
2. Maneuver Performance (individual, technical letter, graded).
3. Cruise Performance (individual, interim, graded).
4. Limited Performance Final (group, final, graded).

Formats and specific report requirements are found in 3 documents:

a. Test Plan (aircraft specific).
b. Test Management Phase Planning Guide, Section III.
c. AFFTC Author's Guide.

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SECTION IV
SPECIFIC FLIGHT REQUIREMENTS

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DATA AIRCRAFT FAMILIARIZATION (FTE/N)

REFERENCE:
Data group aircraft technical order or technical order for aircraft to be flown.

PURPOSE:
1. To familiarize the student with:
    a. The data group aircraft assigned to TPS.
    b. Basic flight principles.
    c. Local flying area.
    d. Aircraft procedures.

AIRCRAFT:
USAF TPS Aircraft.

NOTE: To the maximum extent possible, the FTE/N is to receive an orientation flight in each type of data group aircraft during the performance phase. The C-141 orientation flight will be in conjunction with student pilot training flights, and the FTE/N may or may not get to fly all of the events. However, the emphasis of the C-141 training will be instrumentation training from the FTE station and jump seat.

LIMITATIONS:
As per appropriate technical data.

MISSION EVENTS:
1. <u>Mission Preparation.</u>

Be familiar with the following:
    a. Non-pilot bold face.
    b. Seat limits and strap-in procedures.
    c. Airborne and ground egress procedures.
    d. Use of the normal checklist.
    e. Use of the emergency checklist.
    f. Local flying area map.
    g. Normal, minimum, and emergency fuel quantities.

2. Briefing.

IP: Brief the entire mission. Brief the crew duties that the IP wants the FTE/N to perform, to include:

a. Read and/or monitor the checklist.

b. Verify takeoff data.

c. Assist in emergencies.

d. Clear.

3. Preflight.

IP: Conduct the exterior aircraft preflight with the FTE/N.

4. Takeoff.

IP: Describe and perform a normal takeoff as described in the flight manual.

5. Military Power/NRT/MRP Climb.

IP: Perform the entry for a constant airspeed climb.

a. T-38/F-15/F-16: 350 KIAS.

b. A-37: 250 KIAS.

c. KC-135/C-141: 250 KIAS to 10,000 ft, then intercept climb Mach.

d. C-23: 130 KIAS.

FTE/N: Start the climb at the target airspeed and then vary the pitch attitude at airspeeds above and below the target airspeed. Perform the climb from 5,000 to 25,000 ft PA (T-38/F-15/F-16), 5,000 to 18,000 ft PA (A-37), 5,000 to 20,000 ft PA (KC-135/C-141), or 5,000 to 10,000 PA (C-23).

6. Trim Shots.

IP: Stabilize the aircraft at the following altitudes and airspeeds. Demonstrate the proper technique for a trim shot.

a. T-38/F-15/F-16: 30,000 ft PA, 300 KIAS.

b. A-37: 20,000 ft PA , 200 KIAS.

c. KC-135/C-141: 20,000 ft PA, 225 KIAS.

d. C-23: 10,000 ft PA, 140 KIAS.

FTE/N: Practice a trim shot at the following altitudes and airspeeds:

a. T-38/F-15/F-16: 25,000 ft PA, 280 KIAS.

b. A-37: 18,000 ft PA, 180 KIAS.

c. KC-135/C-141: 20,000 ft PA, 275 KIAS.

d. C-23: 8,000 ft PA, 130 KIAS.

7. Basic Flight Orientation.

IP and FTE/N: The IP will demonstrate and the FTE/N will practice:

a. Aircraft pitch control and its effect on airspeed, altitude, and trim.
b. Throttle control and its effect on airspeed, altitude, and trim.
c. Bank control and its effect on airspeed, altitude, and heading.
d. Constant airspeed turns with the trim power.
e. Constant altitude turns with trim power.
f. Constant airspeed and altitude turns with power as required.
g. Trim changes with gear, flaps, throttles, spoilers and/or speed brakes.

8. Local Area Orientation.

IP: Tour the local area and point out major landmarks that identify the area boundaries.

FTE/N: Correlate the tour with the local area map.

9. Stalls and Recoveries, IP Demo.

IP: Demonstrate the feel of the aircraft as it approaches a stall/stall warning/AOA limiter and the proper recovery technique. This event is designed to give the FTE/N confidence in the aircraft's ability to recover from a stalled/high AOA condition. Stalls or approach to stalls (as applicable) should be demonstrated in both the cruise and power approach configuration.

10. Turn Performance, IP Demo (Optional).

IP: Demonstrate sustained turn performance using a buildup approach to g limits at:

a. T-38/F-15/F-16: 15,000 ft PA, 6g maximum.
b. A-37: 10,000 ft PA, 5g maximum.
c. KC-135/C-141: 10,000 ft PA, 2g maximum.
d. C-23: 8,000 ft PA, 2g maximum.

T-38/F-15/F-16/A-37: Ensure FTE/N has a thorough understanding of anti-g straining maneuvers.

11. Single/Three Engine Flight and Air Start, IP Demo (Optional), N/A for F-16. IP: Demonstrate engine shutdown, single or three engine flight as appropriate, and engine airstart procedures. IAW flight manual and command guidance.

12. Acrobatics, IP Demo (Optional).

The IP may demonstrate appropriate acrobatic maneuvers (high performance aircraft only) at his option. Discuss proper anti-g straining maneuvers, if appropriate.

13. Max Power Climb, IP Demo (T-38/F-15/F-16 only).

IP: Demonstrate a maximum power check climb from 10,000 to 30,000 ft PA.

14. Supersonic Flight, Student Practice (T-38/F-15/F-16 only).

IP and FTE/N: The IP will monitor the FTE/N as the FTE/N flies supersonic. The IP will point out handling qualities, corridor boundaries, and entry and exit procedures.

15. Penetration Descent.

IP: Demonstrate the entry technique for a penetration descent at flight manual airspeeds.

FTE/N: Practice controlling airspeed during the penetration descent through a 10,000 (5,000 for C-23) ft band.

16. Tower Flyby, IP Demo.

IP: Demonstrate a tower flyby.

a. T-38/F-15/F-16: 350 KIAS.
b. A-37: 200 KIAS.
c. KC-135/C-141: 250 KIAS.
d. C-23: 150 KIAS.

17. Simulated Flameout Landing (F-16/A-37 only).

IP: Demonstrate a simulated flameout landing from high key. Verbalize the decision making process involved in assessing the progress of the pattern.

18. Touch-and-Go Landings, IP Demo.

IP: Demonstrate normal traffic pattern procedures. A lakebed landing is optional.

INSTRUMENTATION:

None.

DATA REDUCTION/REQUIRED PLOTS:

None.

TAKEOFF DATA (PILOT, FTE/N)

REFERENCE:

1. Performance Phase Textbook, Chapter 8.

2. AFFTCR 55-2, Volume I, Chapter 6 and Chapter 12,Paragraph 12-15.

PURPOSE:

To gather takeoff data for the data group aircraft limited performance report.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

Only flight manual recommended takeoff procedures will be used. Normally, a maximum of 5 knots of wind is acceptable for valid takeoff data. For TPS training purposes, a maximum of 15 knots is used.

MISSION EVENTS:

NOTE: Takeoff data will be hand-recorded on all data and demonstration missions. There is no dedicated takeoff data flight. If possible, one takeoff will be scheduled for each student utilizing the takeoff and landing facility (Jackson Tower). This takeoff usually is scheduled in conjunction with the level acceleration data mission.

1. Mission Preparation.

Pilot: The pilot will prepare data cards. Takeoff data cards should have spaces for recording pressure altitude, runway temperature, fuel, wind, takeoff roll (or start/lift-off points), and takeoff speeds (rotation, nose wheel lift-off, main wheel lift-off speeds).

2. Briefing.

The pilot will brief the test techniques, data required and data recording responsibilities. In addition, AFFTCR 55-2, Vol I, Paragraph 12-15, describes procedures for takeoffs under Jackson control. These procedures should be reviewed and briefed before flight.

3. Ground Operations.

Pilot: Record a normal performance ground block. Just prior to switching to tower (or Jackson) frequency, record fuel and obtain (from ground control) runway temperature, pressure altitude, and wind. If Jackson Tower is to be used, inform ground control prior to switching frequencies.

4. Takeoff.

Pilot: Line up on the runway at a predetermined point. Make normal engine checks. If applicable, call Jackson Tower ten seconds before brake release, and give a five-second countdown over the radio. Follow flight manual procedures as closely as possible to reduce the effect of pilot technique. Maintain takeoff attitude and configuration to above 50 feet AGL, if distance to 50 feet AGL data is required. The distance to 50 feet may be determined accurately only with theodolite data, but the procedure should be practiced during all takeoffs.

FTE/N: Note and record takeoff distance (from the runway markers) and rotation, nose wheel lift-off, and main wheel lift-off airspeeds.

INSTRUMENTATION:

1.. Hand recorded.

2. Jackson Tower on specified flights.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

TOWER FLYBY DEMO AND DATA (PILOT)

REFERENCES:

1. Performance Phase Textbook, Chapter 5, Pitot Statics.

2. AFFTC Regulation 55-2, Vol I, Chapter 12, paragraph 12-14.

3. Data aircraft test plan.

PURPOSE:

1. To demonstrate and perform the tower flyby (TFB) method of determining pitot-static position errors for the purpose of gathering data for the air data calibration technical letter report and the limited performance final report.

2. To allow the student to demonstrate his ability to plan and perform a mission in an aircraft and environment with which he is relatively unfamiliar, including:
   a. Mission preparation and briefing.
   b. Ground operations.
   c. Takeoff data collection.
   d. Tower flyby procedures and techniques.
   e. Spot landing.

AIRCRAFT:

Data group aircraft. (C-141 data group will receive a T-38 demonstration sortie prior to their data sortie).

LIMITATIONS:

1. V_{max}: 0.95 Mach during tower flybys; Thrust: mil power or less.

2. H_{min}: 50 feet AGL.

3. V_{min}: Final approach airspeed for appropriate aircraft configuration.

4. Minimum altitude to rollout on tower flyby line is 200 ft AGL.

5. Tower flyby operations will be planned at or above 100 ft AGL or one wingspan above the ground, whichever is higher.

MISSION EVENTS:

1. Mission Preparation.

NOTE: C-141 data group tower flybys will be accomplished during the pacer/radar data sortie. Plan to fly pacer/radar points first, if the pacer aircraft must turn to the next flying period.

Pilot:

a. Determine sequence of data points. Since up to four aircraft may be in the TFB pattern at the same time, pilots flying the same period should coordinate flyby airspeeds. Test airspeeds should be evenly spaced from V_{min} to V_{max}. Arrange the sequence of airspeeds to accomplish the 300 KIAS to V_{max} points first, to be followed by the 300 KIAS to V_{min} points.

b. Prepare data cards.

c. Plan mission profile to include options for reflying bad points, or additional points, if fuel permits. The mission shall be terminated with sufficient fuel for one full-stop pattern and landing with normal fuel reserves.

FTE/N:

a. Assist in pre-flight planning.

b. Man the flyby tower and record data.

2. Briefing.

Pilot and FTE/N: Brief sequence of test points, fuel considerations, and criteria for mission termination.

IP: Brief general profile, specific technique for takeoff data, flybys, and spot landings.

3. Ground Block.

Pilot: Perform a performance ground block at the parking ramp.

4. Takeoff.

Pilot: Make a flight manual takeoff. Record takeoff data. Data band: ±3 KIAS of planned takeoff airspeed.

5. Tower Flyby, IP Demo.

NOTE: On downwind leg of the first tower flyby pattern, set altimeter to local setting and level at 3,500 ft indicated altitude. Change altimeter setting to 29.92 in. Hg/ standby mode (if available) and note the indicated altitude. Fly this indicated altitude on all subsequent downwind legs. Retain 29.92 and standby until prior to landing.

IP: Demonstrate a tower flyby at 300 KIAS.

Pilot: Event DAS and record V_i, H_i, TOD, and fuel passing the flyby tower. Place the DAS in record mode prior to tower passage and turn DAS off once data gathering is complete and aircraft is safely under control.

6. Tower Flyby Data, Student Practice.
Pilot: Fly data points to cover the (subsonic) operational envelope of test plan V_{min} (final approach airspeed) to the maximum attainable speed in mil or the test plan V_{max} (C-141: 200 KIAS max).

a. Event the DAS or brief IP to event on your call of tower passage.

b. Call out V_i, H_i, fuel, TOD for each pass (to IP).

c. Normally, 10 points including the demonstration point can be flown.

d. Airspeeds should be within ±5 KIAS of aim airspeed and stable. Altitude must be constant as the tower is passed. Use outside attitude references to establish level flight. Make the last power and attitude adjustments by mid-lakebed.

NOTE: Continue flyby and record data even if V_{aim} is not within tolerance.

e. Radio calls:

(1) Downwind abeam control tower: "Cobra ___, downwind tower flyby, (airspeed)."

(2) Starting base turn: "Cobra ___, base tower flyby."

(3) Established on final and over the pylon: "Cobra ___, final tower flyby, (airspeed)."

f. At 250 KIAS and below, the pattern may be shortened by turning down the railroad tracks north of North Base.

g. Do not overfly North Edwards, North Base, or Boron.

h. Normally, downwind airspeeds are 250 to 350 KIAS. Traffic permitting, a trim shot may be made on downwind at V_{aim} and the power and trim settings noted. For low speed points, maintain a safe maneuvering airspeed until rolling out on final. For other speeds, stabilization on final will be easier if V_{aim} is established on base and maintained through the base turn. Level off 100 feet AGL or slightly higher than one wing span above the ground, whichever is greater (50 ft minimum), and initially set rpm about 1% lower than required on downwind for V_{aim} (traffic permitting).
IP: Record data. Insure proper DAS operation.

7. Spot Landing.

Pilot: Perform a full stop landing in accordance with flight manual procedures.

a. Set altimeter to current altimeter setting.
b. Choose desired touchdown spot prior to final turn.
c. Data band at touchdown: on speed ±3 KIAS.
d. Tolerances:
   (1) T-38/F-15: ±300 ft.
   (2) F-16/C-141: ±500 ft.
e. Qualitatively evaluate flight manual procedures and airspeeds.
f. Use normal braking after touchdown.

8. Ground Block.

Pilot: Perform a performance ground block in the chocks prior to engine shutdown (hand record and DAS).

9. Debriefing.

Pilot and FTE/N: Identify bad data points and any possible data anomalies. Make qualitative comments on takeoff and landing procedures.

IP: Debrief entire mission with emphasis on quality of data.

INSTRUMENTATION:

Mag tape DAS. In addition, all data will be hand-recorded.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

PACER/RADAR DATA (PILOT,FTE/N)

REFERENCES:

1. Performance Phase Textbook, Chapter 5, Pitot-Statics.

2. Aircraft test plan.

PURPOSE:

To use the pacer method to gather subsonic V_i and H_i data for the Air Data System Calibration technical letter report and to determine the aircraft position error. In addition, radar data from SPORT will be used to determine the transonic and supersonic position errors for the aircraft.

AIRCRAFT:

1. Data group aircraft.

2. Pacer: Calibrated T-38A or F-16B.

LIMITATIONS:

1. An IP will fly the pacer aircraft and will be the flight lead.

2. An IP will fly in all formation flights. Student FTE/Ns will, if possible, occupy the rear seat of the data aircraft, and the rear seat of the pacer aircraft.

3. All supersonic runs will be conducted in an approved supersonic corridor.

4. Max airspeed will be max attainable in level flight, or as specified in the test plan.

5. SPORT tracking data is required to accomplish the radar portion of the flight.

6. A calibrated pacer aircraft is required for the pressure survey data.

7. Data and pacer aircraft must be equipped with DAS and C-Band Beacon.

MISSION EVENTS:

1. <u>Mission Preparation</u>.

NOTE: Pilot and FTE/N: Develop flight data cards. Plan at least 10 airspeeds for the pacer portion.

a. Normally, two test aircraft will be scheduled with a pacer calibrated aircraft. Coordinate with other aircraft in the flight.

b. Coordinate with the IP and SPORT to establish specific mission events and procedures for radar lock-on, tracking, and data procedures.

c. Planning:

(1) Pacer: Plan for data point airspeeds ranging from the test plan minimum airspeed to mil Power V_{max}, or the test plan maximum airspeed, whichever is less, at 10,000, 20,000, or 30,000 ft pressure altitude (PA).

(2) Radar:

i. (T-38/F-15/F-16) Plan for one level acceleration in an approved altitude supersonic corridor. Subsonic acceleration can be conducted out of these corridors provided that supersonic flight is in the appropriate airspace. Altitude for each run will be 10,000, 20,000, or 30,000 ft PA. Airspeed will be from 300 KIAS to max Power V_{max}, or the test plan maximum airspeed, whichever is less.

ii. (C-141) Radar data will be gathered simultaneously with pacer data.

2. <u>Briefing.</u>

IP: Brief the general flight profile, formation procedures, radar data procedures, pacer techniques, radio procedures, and specific flight safety items. Telephonically brief SPORT on the mission.

Pilot or FTE/N: Brief the sequence of data points.

3. <u>Ground Operations.</u>

a. All aircraft: Record a performance ground block.

b. Pacer lead should check in with SPORT taxiing out and coordinate for radar coverage times.

4. <u>Takeoff.</u>

Pilot: Perform a single-ship takeoff as briefed by the IP. Record takeoff data. Rejoin or rendezvous with pacer lead aircraft as briefed.

5. <u>Pacer Test Points.</u>

IP: Fly pacer lead. Record V_i, H_i, fuel for each test point. For C-141 pacer data, fly the wing position.

Pilot: Fly the pacer wing or lead position as briefed.

a. While taking data, fly line abreast with calibrated altimeters at the same elevation as the pacer, with at least 1/2 wing span separation. One to two wing spans separation is preferable.

b. Lead aircraft will stabilize at the desired V_i and H_i. When stable, he will call "(Call Sign), STABLE."

c. When stable in the wing position, the number two aircraft will call (Call Sign), READY."

d. When stable in the wing position, the number three aircraft will call "(Call Sign), READ." FTE/N in all three aircraft will event DAS on the "READ" call.

e. Record V_i, H_i, fuel, TOD, and run DAS from at least 5 seconds prior to each point until reading is complete.

f. Lead will remain stable until all wingmen have read. If lead does not maintain stable flight, he will call "(Call Sign), OFF POINT."

g. After reading data, the formation may be loosened while cockpit data are hand-recorded.

6. Radar Data Test Points.

NOTE: C-141 radar data will be gathered simultaneously with pacer data. A pressure survey may be conducted by the pacer aircraft before or after the test aircraft data is collected. As a backup, pacer aircraft pacer data may be used as pressure survey data for the radar method.

IP:

a. Establish communications and radar contact with SPORT.

b. Once SPORT is tracking, get vectors to fly the same ground track as the data aircraft will be flying. The pressure survey information will be collected in a data run at least 30 miles long at 15-second intervals. Generally, the run will be accomplished from east to west.

c. The pressure survey run will be at a constant 300 KIAS (or at an airspeed where pacer aircraft air data system calibrations are known), at 10,000, 20,000, or 30,000 ft PA. The test aircraft must have obtained a pacer point at this airspeed and altitude.

d. Time correlation with SPORT is required for data reduction. At the beginning and end of the constant airspeed and altitude run, the tone button can be used to synchronize times between the pacer aircraft and SPORT.

e. At the completion of the pressure survey run, the pacer aircraft has completed his mission requirements and may RTB, or wait for rendezvous with subsequent test aircraft.

Pilot:

a. Establish radar contact with SPORT.

b. Make a maximum power level acceleration gathering data from 300 KIAS to the max airspeed attainable in level flight, or the test plan limit, whichever is less.

It is essential that the supersonic portion of this mission be accomplished in the appropriate supersonic corridor and that the ground track be as close to that of the pacer lead aircraft. SPORT will give vectors to help maintain the proper ground track.

c. A constant altitude should be maintained throughout the maneuver. This will require a constant nose down pitch rotation, initially large but decreasing as airspeed increases. This may be accomplished by a series of precise nose down pitch changes to keep the VVI within ±100 fpm. Pitot-static instruments will become invalid in the 0.97 to 1.07 Mach range. Fly ATTITUDE! For the T-38, the direction of stick movement required for a nose down change may reverse in the region of speed instability above approximately 0.93 Mach number. If turning while decelerating through the Mach, be alert for Mach tuck.

d. Take data with the DAS from the beginning of the acceleration to its termination. Time correlation with SPORT is required to correlate position for data reduction. The UHF tone can be used to synchronize time with SPORT.

e. Test aircraft will recover individually unless an IP is in the formation.

7. Spot Landing.

Practice a spot landing within appropriate tolerances.

8. Ground Block.

All aircraft complete a performance ground block (hand record and DAS).

9. Debriefing.

IP: Critique student technique.

Pilot and FTE: Identify any periods of bad data. Make qualitative comments concerning the ease or difficulty of flying the wing position at the various speeds. Make qualitative comments concerning the ease or difficulty of maintaining level flight transonically. Identify the Mach range where pitot-static instruments are not reliable and describe the indications through that range.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

MISSION DIRECTOR ORIENTATION (FTE/N)

REFERENCE:

1. Performance Phase Textbook.

2. Appropriate aircraft flight manual.

3. Mission Director FTT slides.

PURPOSE:

To familiarize the student with:

a. Crew coordination.
b. In-flight data taking techniques.
c. Basic flying techniques.
d. Flight manual.
e. Trim shot techniques.
f. Introduction to directing a test mission.

AIRCRAFT:

C-23A.

LIMITATIONS:

1. A 60° bank angle limitation will be observed throughout the flight. The minimum airspeed (V_{min}) will be 1.1 times the power off stall speed (V_s) in the appropriate configuration.

2. Unless specified otherwise, power settings for all test points will be the lower of 720°C ITT or 3,500 lb ft torque at 1400 prop rpm (Maximum Recommended Power - MRP).

GENERAL:

This ride is designed to familiarize FTE/Ns with the C-23 and to introduce students to directing a test mission. One FTE/N and student test pilot will fly with an IP and Instructor FTE/N on a 1.5 hour flight. Data collection and parameter (data band) specification is the responsibility of the FTE/N. The FTE/N may use the Instructor FTE/N and IP to aid in data collection.

MISSION EVENTS:

1. Mission Preparation.

FTE/N: Prepare flight and data cards; include a mission timeline and a fuel burn curve as part of the mission cards. Precompute anticipated takeoff groundrun and distance, climb, cruise, and descent performance.

2. Briefing.

The pilot will give the general flight briefing, with the IP briefing C-23 specifics. The Instructor FTE/N will demonstrate portions of the specific mission briefing. The FTE/N will brief the remainder of the specific mission briefing.

3. Ground Block.

Instructor FTE/N: Demo a performance ground block.
FTE/N: Record performance ground block.

4. Takeoff.

IP: Demo a flight manual 4°flap takeoff.
Instructor FTE/N: Demo mission director techniques for gathering takeoff data.
FTE/N: Provide torque limits (MTOP/RTOP/MCP settings) prior to takeoff. Record takeoff data to include pressure altitude, winds, OAT, V_{TO}, takeoff distance, and gross weight.

5. Check Climb.

Pilot: Perform a MRP (1400 prop rpm) climb at 130 KIAS from 4,000 to 8,000 ft PA. The IP may demo the entry and initial check climb technique.
Instructor FTE/N: Demo mission director techniques for gathering check climb data. Record climb data to include time to climb, fuel used to climb, airspeed, altitude, OAT, rate of climb, and power settings.

6. Trim Shot.

Pilot: Perform a trim shot at 9,000 ft PA at airspeeds determined by FTE/N. Emphasize attitude flying and proper trimming procedures using rudder, aileron, and elevator.
FTE/N: Provide airspeed for trim shot based on flight manual data. Airspeeds for long range or maximum endurance are possible choices. Record cruise data to include airspeed, altitude, torque, prop rpm, weight, fuel flow, and OAT. Compare to flight manual.

7. Level Acceleration, IP Demo.
IP: Perform a MRP (1400 prop rpm) level accel from $1.1V_s$ to V_{max} at 9,000 ft PA.
Instructor FTE/N: Demo mission director techniques for gathering level acceleration data. Record time increments, airspeed, altitude, temperature, VVI, and fuel remaining. Explain the importance of good crew coordination and some of the limitations of taking handheld data.

8. 4° Flap Level Acceleration.
Pilot: Perform a MRP (1400 prop rpm) level accel from 1.1 V_s to V_{max} at 9,000 ft PA with flaps at 4°. The IP may demo this event if desired.
FTE/N: Record time increments, airspeed, altitude, temperature, VVI, and fuel remaining.

9. Check Descent, IP Demo.
Pilot: Perform a maximum rate descent (175 KIAS, flight idle, 1675 prop rpm) from 8,000 to 4,000 ft PA.
FTE/N: Record descent data to include airspeed, altitude, weight, OAT, time to descend, and fuel used to descend.

10. ILS Approach.
IP: Perform an ILS approach explaining basic ILS procedures and use of instruments.

11. Touch-and-Go Landings.
IP: Demonstrate the short takeoff and landing capabilities of the C-23A.
Pilot: Touch-and-go/full stop and a lakebed landing are optional.

12. Ground Block.
FTE/N: Record performance ground block data.

13. Debriefing.
FTE/N: Discuss data quality, crew coordination, comparison of data to the flight manual, etc.
IP and IFTE/N: Provide feedback on mission director and crew coordination techniques.

INSTRUMENTATION:
Stopwatch.

DATA REDUCTION/REQUIRED PLOTS:
Compare climb, cruise, acceleration, and descent data to flight manual.

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LEVEL ACCEL/TURN PERFORMANCE DEMO (FTE/N)

REFERENCE:

Performance Phase Textbook, Chapter 9, Energy.

PURPOSE:

To demonstrate and allow the student to practice:

a. Directing a mission.

b. The 1g level acceleration and deceleration methods of determining specific excess power (P_s).

c. The loaded level acceleration and deceleration methods for determining P_s.

d. Sawtooth climb method for determining P_s.

e. Techniques for determining sustained level turn performance.

(1) Stabilized Load Factor Method.

(2) Stabilized Airspeed Method.

AIRCRAFT:

C-23A.

LIMITATIONS:

1. A 60° bank angle limitation will be observed throughout the flight. The minimum airspeed (V_{min}) will be 1.1 times the power off stall speed (V_s) in the appropriate configuration.

2. Unless specified otherwise, power settings for all test points will be the lower of 720°C ITT or 3,500 lb ft torque at 1400 prop rpm (Maximum Recommended Power - MRP).

GENERAL:

Two FTE/Ns will fly with a TPS graduate IP and Instructor FTE/N on a 1.5 hour flight. Data collection and parameter (data band) specification is the responsibility of the FTE/N seated aft of the cockpit area. Each FTE/N will be given a sortie as the mission director and a sortie in the seat to practice level accel/turn FTTs.

MISSION EVENTS:

1. <u>Mission Preparation.</u>

FTE/N: Prepare data cards. Data cards should include configurations, airspeed ranges, load factors, test altitudes, power settings, fuel remaining, and time correlation as appropriate. Determine the climb and descent winds and plan accordingly. Bring a sensitive g-meter on the mission.

2. Briefing.

IP: Brief the flight profile, emphasizing the specific techniques for check climbs, check descents, level accelerations, level decelerations, and turn performance.

3. Ground Block.

FTE/N: Accomplish a performance ground block.

4. Takeoff.

IP: Make a Maximum Takeoff Power (MTOP) takeoff.

FTE/N: Record takeoff data.

5. Check Climb, IP Demo.

IP: Perform a MRP 1400 prop rpm climb from 4,000 to 8,000 ft PA.

Tolerance: ±2 KIAS.

FTE/N: Record time, fuel used, rate of climb, torque, ITT, prop rpm, and OAT.

6. Trim Shot, IP Demo.

IP: Perform a trim shot at 8,000 ft PA, 125 KIAS with a 1400 prop rpm setting. This airspeed was chosen as the mid-band speed for the subsequent event (level acceleration demo). IP should explain the significance of directional, lateral, and longitudinal trim. Explain why a trim shot may or may not be desirable prior to level acceleration runs.

7. Level Acceleration Demo, IP Demo.

IP: Demonstrate a MRP 1400 prop rpm level acceleration at 8,000 ft PA, 1.1 V_s to V_{max}.

a. Stabilize at 1.1 V_s at an altitude slightly below the desired data band (about 7,500 ft PA) and note the aircraft pitch attitude.

b. Apply power and begin a constant airspeed climb. Approaching 8,000 ft, rotate the aircraft to the level flight attitude to start the accel; considering the C-23 climb rate, a 20 ft lead point is adequate for an aggressive level-off. Continue decreasing pitch attitude to maintain level flight as the aircraft accelerates. As acceleration approaches zero (approximately 1 knot in 10 seconds), the maximum attainable speed in level flight (V_{max}) may be more quickly determined by climbing a few hundred feet (200-300 ft works well for the C-23) and then accelerating in a slight descent to level off in the altitude band a few knots faster than the maximum speed. The aircraft will decelerate to V_{max} in 10 to 20 seconds; this is known as "anchoring" the point. Negative P_s data may be gathered at airspeeds above V_{max} by climbing well

above the data band (500-1000 ft high for the C-23), accelerating to near V_{max}, and then accelerating to near the aircraft maximum operating airspeed (V_{MO}) in a dive back into the data band. An airspeed buffer may be established to prevent exceeding V_{MO}. Level off in the data band near V_{MO} at MCP and begin recording data when altitude is stable as the aircraft decelerates back to V_{max}.

c. Consider the following items:

(1) The objective of this maneuver is to collect data to calculate specific excess power (P_s):

$$P_s = \frac{dH}{dt} + \frac{V}{g} \cdot \frac{dV}{dt}$$

(2) To gather the acceleration data, dH/dt should be kept as close to zero as possible. Therefore, a VVI reading of zero should be maintained throughout the run. Hysteresis effects on the altimeter will be neglected.

d. Data band: ±500 ft.

Tolerances: ±100 ft, ±100 ft/min.

FTE/N: Collect hand-held performance data to include start/stop fuel, time, airspeed, altitude, OAT, power settings, and appropriate qualitative comments.

8. Level Decel Demo, IP Demo.

IP: Demonstrate a flight idle power, 1g level deceleration at 8,000 ft PA, V_{max} to 1.1 V_s. Since the engine requires some time to stabilize in idle, if data is required from V_{max} it is necessary to begin the deceleration above that speed. It is possible to begin taking deceleration data from above V_{max} by entering the altitude band in an idle power high-speed descent, near V_{MO}. Level off in the data band; data can be recorded when stable on conditions.

Data band: ±500 ft.

Tolerances: ±100 ft, ±100 ft/min.

FTE/N: Collect data as per #7 above.

9. Level Accel/Decel, Student Practice.

FTE/N (in seat): Practice level acceleration/deceleration runs for conditions specified in Events 7 and 8, respectively.

10. Loaded Level Accel, IP Demo.

IP: Demonstrate a MRP 1400 rpm 1.4g level acceleration at 8,000 ft PA, 1.1 V_s for 45° bank to V_{max} (P_s = 0). The maneuver should be performed at a constant load factor

with VVI = 0. If no g-meter is available, g may be approximated initially by establishing a level turn at a bank angle commensurate with the desired g; g must then be held constant by seat-of-the-pants feel. Bank should be varied slightly about the initial bank angle to control altitude and maintain vertical velocity near zero. A wings-level or 30° banked climbing entry works well. The point may be anchored, and negative P_s data may be gathered to near V_{MO} in a manner similar to that described for the 1g level accel.

Data band: ±500 ft.

Tolerances: ±100 ft, ±200 ft/min, ±0.2g.

FTE/N: Record appropriate data.

11. Loaded Level Decel, IP Demo.

IP: Demonstrate a flight idle power 1.4g level deceleration at 8,000 ft PA, from the predetermined V_{max} to 1.1 V_s for 45° bank. Techniques for maintaining the desired g at the desired altitude are the same as those described for the loaded level accel. Data may be gathered from above V_{max} using a descending entry similar to that described for the 1g level decel.

Data band: ±500 ft.

Tolerances: ±100 ft, ±200 ft/min, ±0.2g.

FTE/N: Record appropriate data.

12. Sawtooth Climb, IP Demo.

IP: Perform a sawtooth climb through the band 7,500 to 8,500 ft PA at 105 KIAS.

Data band: ±3 KIAS.

Tolerance: ±1 KIAS.

FTE/N: Collect hand-held performance data to include start/stop fuel, time, airspeed, altitude, power settings, OAT, and appropriate qualitative comments.

13. Trim Shot, Student Practice.

FTE/N (in seat): Perform a stabilized trim shot at 8,000 ft PA, 130 KIAS.

Data band: ±2 KIAS, ±100 ft.

Tolerances: ±2 KIAS, stable for 10 seconds.

FTE/N: Note the trim torque setting for stabilized airspeed level turns.

14. Stabilized Turns (constant load factor & constant airspeed), IP Demo.

IP: Demonstrate a series of MRP 1400 prop rpm stabilized load factor level turns at 8,000 ft PA, 1.2, 1.4, and 2.0 g, 1400 prop rpm. This method is normally used for the front side of the power required curve. Accelerate to V_{max} at MRP, using the

anchoring technique. Note V_{max} for 1.0g and roll into approximately 30° bank, simultaneously applying a constant 1.2g to maintain level flight. Allow the airspeed to stabilize, and after 10 seconds of stabilization, record the load factor, V_i, H_i, T_i, fuel. Increase bank angle to approximately 45° and simultaneously increase g to 1.4 to maintain level flight, and allow the airspeed to stabilize again. After 10 seconds, repeat the recording procedure outline above. Repeat the entire procedure for 2.0g (approximately 60° bank). Load factor is read directly from the g-meter for this demonstration (if available). It is important to understand that g must be held constant during stabilized turn performance testing, and that small variations in bank are used to control altitude and minimize vertical velocity excursions.
FTE/N: Record performance data to include fuel, torque, OAT, airspeed, altitude, and g at each point.

IP: Demonstrate a stabilized airspeed level turn at 8,000 ft PA, 120 KIAS, (1400 prop rpm). Use the torque setting for 130 KIAS (from event 13) plus 250 lb ft. The stabilized airspeed method can easily be utilized on either the front side or the back side of the power required curve. Generally, it is used for the back side of the curve. Maintain a level turn utilizing back pressure (bank angle) to maintain a stable airspeed. The timed turn data collection method will be used to determine the resulting load factors for this demonstration.
FTE/N: Record performance data to include fuel, torque, OAT, airspeed, altitude, and time for turn. Record g for data comparison.

Data band: ±4 KIAS, ±500 ft.

Tolerances: ±2 KIAS, ±100 ft, ±100 ft/min, ±0.2g.

15. Stabilized Load Factor Turns, Student Practice.
FTE/N: Perform stabilized load factor turns at 8,000 ft PA, 1.2, 1.4, and 2.0g. Use a torque setting for 130 KIAS plus 250 lb ft.

16. Timed Turn with Stabilized Airspeed, Student Practice.
FTE/N: Perform stabilized airspeed turns at 8,000 ft PA, 125 KIAS and 115 KIAS. Use torque setting for 130 KIAS plus 250 lb ft. Time turns to determine load factor.

17. Check Descent, IP Demo.
FTE/N (in seat): Perform a long range descent (150 KIAS, 400 ft/min, 1200 prop rpm) from 8,000 to 5,000 ft PA. Power may vary depending on atmospheric conditions.
FTE/N: Record fuel used, time to descend, rate of climb, OAT, as well as any other pertinent data.

Tolerance: ±2 KIAS.

18. ILS Demo and Landing.
IP: Perform an ILS demonstration and landing using flight manual computed airspeeds and procedures.

19. Ground Block.
FTE/N: Accomplish a performance ground block.

20. Debriefing.
IP: Critique all maneuvers.
FTE/N: Critique quality of data for all items.
IFTE/N: Critique mission director techniques.

INSTRUMENTATION:

1. Stopwatch.

2. Tape recorder.

3. Sensitive g-meter (sign out from the Technical Support Division; if flying first period, sign out items the afternoon prior to this sortie).

DATA REDUCTION/REQUIRED PLOTS:

Determine load factor from the timed turns using the appropriate equation.

LEVEL ACCELERATION/SAWTOOTH CLIMB DEMO (PILOT)

REFERENCE:

Performance Phase Textbook, Chapter 9, Energy.

PURPOSE:

To demonstrate and practice the flight test techniques used in:

a. The level acceleration method of determining specific excess power (P_s).

b. The loaded level acceleration and deceleration methods of determining P_s.

c. The sawtooth climb method of determining P_s.

AIRCRAFT:

T-38A.

LIMITATIONS:

Loaded decelerations will be terminated at moderate buffet.

MISSION EVENTS:

1. Mission Preparation.

Pilot: Prepare flight cards, including the items defined in this briefing guide. Data cards should include DAS time, run number, event number, and fuel at the start and completion of each data run. Review the pitot-static corrections required to fly a constant altitude at transonic Mach numbers.

2. Briefing.

IP: Brief the flight profile, emphasizing specific techniques for check climbs, check descents, level accelerations, sawtooth climbs, and level decelerations.

3. Ground Block.

Pilot: Accomplish a performance ground block (hand record and DAS).

4. Takeoff.

Pilot: Make a max power takeoff. Record the takeoff data, and if assigned to the T-38A data group, retain for the limited performance report.

5. Mil Power Check Climb, Student Practice.

Pilot: Perform a flight manual mil power check climb from 5,000 ft to 20,000 ft PA.

a. Record fuel and DAS time prior to climb entry. If the aircraft is instrumented, data should be turned on at this time.

b. Record fuel passing 20,000 ft PA.

c. Tolerance: ±2 KIAS.

6. Trim Shot, IP Demo.

IP: Demonstrate a trim shot at 25,000 ft PA and 220 KIAS. When executing a level accel for performance data, pitch trim may be used since the T-38A has an all-moving stabilizer. However, this may affect the data on aircraft with trim tabs. On such aircraft, a technique often used is to set the pitch trim at a mid band airspeed. Check with the performance engineers as to whether they want data trimming throughout the maneuver or with trim set to a mid-range value. Being able to perform a precise trim shot is essential to gathering data during the cruise phase. For a discussion on trim shots and how they relate to cruise testing, see the General section in the Cruise Data ride.

7. Mil Power Level Accel, IP Demo.

IP: Demonstrate a mil power level acceleration 25,000 ft PA, 230 KIAS to 0.9 Mach.

a. Stabilize slightly low in the data band, at a speed slightly below the desired data band airspeed (about 220 KIAS).

b. Simulate data procedures:

(1) Data record switch - ON.

(2) Record fuel, DAS time.

c. Apply mil power and maintain a stable airspeed in a slight climb for 10 seconds to allow the engine to stabilize. Prepare to begin a series of precise nose down pitch changes to keep the aircraft from climbing.

d. The objective of this maneuver is to collect data to determine P_s:

$$P_s = \frac{dH}{dt} + \frac{V}{g} \cdot \frac{dV}{dt}$$

(1) In order to simplify data reduction, the acceleration must be in level flight (pressure altitude = constant), hence:

$$\frac{dH}{dt} = 0$$

Fly attitude, using the vertical velocity indicator (VVI) as the primary performance instrument. The accel run will require a series of precise nose down pitch changes to keep the VVI within the test tolerance of ±100 fpm. Use trim and or stick force to control pitch. If the position error corrections change significantly with airspeed, use

a constant pitch rate to maintain a constant tapeline altitude. Know what your indicated altitude should be by applying the position error corrections.

(2) This maneuver may also be used to gather flying qualities (stick force vs airspeed) data. For this purpose, trim speed is more critical, and stick movement must be smooth and constant in direction. Vertical velocity is not as critical as for the level accel. With proper technique, both types of data may be gathered during the same maneuver.

(3) Data recording is terminated when the desired Mach number is reached or when the rate of acceleration becomes quite small (typically, less than 1 KIAS increase in 10 seconds).

e. Data band: ±500 ft.
Tolerances: ±100 ft, ±100 ft/min.

8. Mil Power Loaded Decel, IP Demo.

IP: Demonstrate a mil power, 3g level decel at 25,000 ft PA from 0.9 Mach to moderate buffet.

a. Allow airspeed to increase to 10-20 KIAS above the desired data band. Roll into and stabilize at a 3g level turn. Maintain 3g and level flight, and allow the aircraft to decelerate until reaching moderate buffet.

b. Simulate all data procedures.

c. The load factor must be held constant throughout this maneuver by proper use of the elevator control. Use bank angle (not load factor) to maintain altitude.

d. This maneuver is used to gather negative P_s data.

e. Data band: ±500 ft.
Tolerances: ±100 ft, ±100 ft/min, ±0.2g.

9. Mil Power Level Accel, Student Practice.

Pilot: Perform a mil level accel at 25,000 ft PA, 250 KIAS to V_{max}.

a. Simulate all data procedures.

b. Event and comment wherever data are bad (VVI and altitude out of tolerance or data band). Remember that, on this flight, you are interested primarily in performance data.

c. When acceleration decreases to 1 knot in 10 seconds, terminate the maneuver and turn all data off. A stick force reversal may be noticed after 0.93 Mach. This reversal is a result of the center of pressure on the wings shifting aft from approximately 25% chord to 50% chord. Keep the pitch attitude constant, between changes, with whatever elevator pressure is required.

d. Make qualitative comments concerning stick forces.

10. Mil Power Loaded Decel, Student Practice.

Pilot: Perform a mil power, 3g level decel at 25,000 ft PA. Begin the maneuver from 1g mil power V_{max} (0.9M).

a. Simulate all data procedures.

b. If the aircraft stops decelerating, you have reached a stable 3g, $P_s = 0$ point. Increase load factor, decrease airspeed 10-20 kts, and return to 3g. If the aircraft still does not decelerate, repeat the procedure. Once a deceleration (negative P_s) region is reached, the aircraft will continue to decelerate. Terminate the maneuver at moderate buffet.

11. Sawtooth Climb, IP Demo.

IP: Demonstrate a mil power sawtooth climb at 25,000 ft PA and 225 KIAS.

a. The sawtooth climb is another method for gathering P_s data; it is generally used for slow speed aircraft or in situations where there exists a small flight envelope (e.g. the T-38 at 40,000 ft PA). Instead of the dH/dt term equaling zero, the dV/dt term goes to zero while airspeed is held constant.

b. Ideally the altitude data band should be about one minute in duration. Once initial points are flown, the altitude band can be adjusted.

c. Set up to allow timing from 24,500 to 25,000 ft PA. Start the maneuver at about 23,500 ft PA, set mil power, and simultaneously enter a climb at 225 KIAS. Power should be stabilized for 10 seconds prior to data band entry. Maintain airspeed precisely (±1 KIAS) to insure good data and start timing (DAS on) passing 24,500 ft PA. Stop timing passing 25,500 ft PA, but do not anticipate the top of the band and level early -- smoothly fly through the data band, turn DAS off, then transition to the next maneuver.

d. Data band: ±3 KIAS.
Tolerance: ±1 KIAS.

12. Sawtooth Climb, Student Practice.

Pilot: Perform sawtooth climbs at 25,000 ft PA, 200, 250, and 275 KIAS. Assess the T-38 climb performance at this altitude and configuration.

13. Trim Shot, Student Practice.

Pilot: Perform a trim shot at 30,000 ft PA, 0.85 Mach.

Data band: ±0.02 M, ±100 ft.

Tolerances: ±0.02 M, stable for 10 seconds.

14. Max Power Level Accel, Student Practice.

Pilot: Perform a max power level accel at 30,000 ft PA, 0.85 to 1.1 Mach.

a. Procedures and techniques are identical to the mil power accel.

b. The speed stability (stick force gradient) will probably reverse in the 0.93 to 0.95 Mach region.

c. Pitot-static trend information becomes invalid in the 0.97 to 1.07 Mach range. The only reference available is the aircraft attitude; smooth, very small pitch changes should be continued through this range.

d. Data band: ±500 ft.
Tolerances: ±100 ft, ±100 ft/min (N/A transonic).

15. Max (Mil) Power Loaded Decel, Student Practice.

Pilot: Perform a 4g level deceleration at 30,000 ft PA from 1.1 to 0.9 Mach.

a. At 1.1 Mach, roll into a 4g turn with max power. Maintain 4g and level flight while decelerating to 0.90 Mach.

b. The outside horizon is the only reliable reference for level flight. Use the accelerometer as reference for load factor, and vary stick force to maintain a constant load factor. Vary bank angle to maintain level flight.

c. Simulate recording data throughout this maneuver.

d. The transition from supersonic to subsonic speeds while holding g on the aircraft results in a mild nose rise.

e. This maneuver can be used to gather either negative P_s or handling qualities data. In the first case, load factor is the important parameter. In the second case, stick force and movement are primary.

f. Data band: ±500 ft.
Tolerances: ±100 ft, ±200 ft/min (N/A transonic), ±0.2g.

16. High Speed Descent, Student Practice.

Pilot: Perform a 0.84 Mach descent from 30,000 ft to 10,000 ft PA.

a. Power: Idle.

b. Configuration: Speed brakes out, shoulder harness locked. Set up for this maneuver at least 3,000 ft above the data band and at 0.87 Mach. Configure the aircraft and push over to intercept 0.84 Mach.

c. The purpose of this maneuver is to simulate an emergency descent from altitude maintaining a constant 0.84 Mach.

d. Tolerance: ±0.02 Mach.

17. <u>Trim Shot, Student Practice.</u>

Pilot: Perform a trim shot at 10,000 ft PA, 200 KIAS.

Data band: ±2 KIAS, ±100 ft.

Tolerances: ±2 KIAS, stable for 10 seconds.

18. <u>Mil Power Level Accel, Student Practice.</u>

Pilot: Perform a mil power level accel at 12,000 ft PA, 220 KIAS to V_{max}. Record data as before. Climb from 10,000 ft to 12,000 ft PA in mil power with the speed brake out. Approaching 12,000 ft PA, retract the speed brake and push over to slightly below the previous trim shot's pitch attitude.

NOTE: This technique is not appropriate for all aircraft. In some aircraft, extending the speed brake at a high AOA with mil power can cause an engine compressor stall and flameout. Consult the appropriate flight manual.

19. <u>Mil Power Loaded Decel, Student Practice.</u>

Pilot: Perform a mil power, 3g level decel at 12,000 ft PA from V_{max} to $P_s = 0$. You will find a stable point ($P_s = 0$) in this maneuver. Finally, reduce the power to idle and perform a 2g level decel to moderate buffet.

20. <u>Mil Power Loaded Accel, Student Practice.</u>

Pilot: Perform a 2g level accel, 12,000 ft PA, 270 KIAS to $P_s = 0$ (stable point). A technique is to slow to 220-230 KIAS, advance throttle to mil, and roll into a 2-3g level turn. Use load factor to maintain airspeed for about 10 seconds to allow engines to stabilize. Then decrease load factor to 2g and let the aircraft accelerate. Procedures and techniques are the same as in a loaded decel. When the airspeed stabilizes at the $P_s = 0$ point, reduce the power to idle and practice a 2g level decel setting up for the next point.

20. <u>Spot Landing.</u>

Pilot: Perform a full stop spot landing using flight manual procedures.

Data band: on speed ±3 KIAS.

Tolerance: ±300 ft.

21. <u>Ground Block.</u>

Pilot: Accomplish a performance ground block prior to engine shutdown.

22. Debriefing.

Pilot: Identify areas of bad data. Make qualitative comments concerning stick forces during all accels and decels.

DATA REDUCTION AND ANALYSIS:

None.

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LEVEL ACCELERATION/SAWTOOTH CLIMB FTT PRACTICE (PILOT, FTE/N)

REFERENCES:

1. Performance Phase Textbook, Chapter 9, Energy.
2. Applicable test plan, USAF TPS, Limited Performance Evaluation.

PURPOSE:
To practice level acceleration and sawtooth climb flight test techniques. Each pilot will receive one sortie in which to practice these techniques in his data group aircraft. The FTE/N for the data group will occupy the additional seat on one flight to practice data collection techniques and in-flight management.

AIRCRAFT:
Data group aircraft.

LIMITATIONS:
Individual data group test plan limitations will apply.

MISSION EVENTS:
The student pilots will plan a mission that will enable them to improve their proficiency in level acceleration and sawtooth climb flight test techniques. The data card will be approved by an appropriate TPS staff IP. Pilots or FTE/Ns from different data groups may be scheduled to fly with the pilot practicing the FTT. If possible, a DAS-equipped aircraft will be made available.

INSTRUMENTATION/DATA REDUCTION/REQUIRED PLOTS:
None.

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LEVEL ACCELERATION/SAWTOOTH CLIMB DATA (PILOT, FTE/N)

REFERENCES:

1. Performance Phase Textbook, Chapter 9, Energy.

2. Aircraft test plan.

PURPOSE:

To allow the student to use the level acceleration and/or sawtooth climb method to gather P_s and mil/max thrust available propulsion data for the Limited Performance Report.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

As per the test plans.

MISSION EVENTS:

1. <u>Mission Preparation.</u>

Individual data mission requirements will be assigned by the test team leader based upon the applicable test plan.

2. <u>Briefing, Ground Operations, Takeoff, and Climb.</u>

Accomplish in accordance with standard operating procedures and previously demonstrated FTTs.

3. <u>Level Accelerations /Sawtooth Climbs.</u>

Pilot: Perform level accelerations and/or sawtooth climbs for data at the assigned conditions.

   a. If instrumentation is not available, call out airspeeds on a voice recorder.
   b. Hand record fuel, TOD, and DAS time before and after each run.

4. <u>Descent, Ground Block, and Debriefing.</u>

Accomplish in accordance with standard operating procedures and previously demonstrated FTTs.

INSTRUMENTATION:

1. Mag tape DAS.

2. Cassette recorder.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

TURN PERFORMANCE/CHECK CLIMB/CHECK DESCENT DEMO (PILOT)

REFERENCE:
Performance Phase Textbook, Chapter 9, Energy.

PURPOSE:

1. To practice mission planning and conduct, ground operations, takeoff data collection, trim shots, and spot landings.

2. To demonstrate and to practice flight test techniques for determining sustained level turn performance (sustained load factor, turn rate and turn radius) using stabilized load factor or stabilized airspeed turns.

3. To demonstrate and to practice check climbs and check descents.

AIRCRAFT:
F-16B/D, with one centerline or two wing fuel tanks.

LIMITATIONS:
Flight manual limitations.

MISSION EVENTS:

1. <u>Mission Preparation.</u>

Pilot: Prepare mission profile and data cards.

a. All DAS data procedures will be simulated.

b. Collect hand held data for all turn performance points flown (H_i, V_i, load factor, fuel remaining, and DAS times, if available).

c. Determine climb and descent winds and plan your flight accordingly. Ascertain the wind direction and magnitude from 5,000 to 30,000 ft PA. Plan all climbs/descents on headings 90° to the average wind in the altitude band being flown. This procedure minimizes errors due to windshear. Obtain forecast temperatures up to 30,000 ft. Anticipate required pitch changes at altitudes where significant changes in wind or temperature gradients occur.

d. Prepare data cards. These should include spaces to record fuel, TOD, and magnetic tape DAS information at the start and end of each run. Leave room for qualitative comments on pilot techniques, required deviations from the schedule, and ease of maintaining schedule. Provide the IP with a copy of the cards before the brief.

e. Prepare an easy-to-read climb schedule card using the climb schedule depicted in Table 1. This should include airspeed vs. altitude every 2,000 ft PA for mil power climbs, and airspeed and Mach number vs. altitude at least every 5,000 ft PA for max power climbs.

f. A template overlay for the airspeed indicator may be used to aid the pilot in maintaining the climb schedule.

Table 1
F-16 CLIMB SCHEDULES

MIL POWER		MAX POWER	
ALTITUDE (1000 FT PA)	AIRSPEED (KCAS/MACH)	ALTITUDE (1000 FT PA)	AIRSPEED (KCAS/MACH)
4	454/.73	5	550/.90
6	446/.74	10	510/.90
8	438/.76	15	470/.91
10	430/.77	20	430/.91
12	422/.78	25	390/.91
14	414/.79	30	350/.91
16	406/.80		
18	398/.82		
20	390/.83		
22	382/.85		
24	374/.86		
26	366/.87		
28	358/.89		
30	350/.91		

NOTE: This climb schedule is for demo purposes only and is not intended for use by the F-16 data group for reporting purposes.

2. Briefing.

Pilot: Brief the entire mission, excluding flight test techniques.

IP: Brief specific techniques pertaining to turn performance and check climbs/check descents.

3. Ground Block.

Pilot: Record a performance ground block.

4. Takeoff.

Pilot: Perform a mil power takeoff (max power takeoff with wing fuel tanks). Record takeoff data. Climb to 3,500 ft PA, 350 KCAS, and stabilize. Set 29.92 and pneumatic in the altimeter, complete the Climb/In-Flight/Operational checks, and set a reference pitch attitude on the attitude indicator. Advise the controlling agency of the numerous rapid climbs and descents which will be performed, so they can better aid in clearing your flight path.

5. Mil Power Check Climb, IP Demo.

IP: Demonstrate a mil power check climb from 5,000 ft to 20,000 ft PA.

a. Turn the data record switch on before selecting mil, and off at the end of the run. Event at the beginning and end of the altitude band, and when off schedule.

b. Plan to climb on a heading 90° to the average climb winds. Operational requirements may dictate other headings.

c. At about 350 KCAS and 3,500 ft PA, select mil power and check engine operation. Maintain 3,500 ft as the aircraft accelerates.

NOTE: The engine needs to be completely stabilized at mil (or max) power prior to data band entry during all performance testing. If using an instrumented aircraft, stabilization can be determined from real time data results and the pilot cleared into the data band. Turbojet engines may require up to 20 sec to stabilize and turbofan engines up to 30 sec. At TPS, a 10 sec time period will be used to simulate this stabilization time period.

d. During the entry, the initial climb airspeed is governed by the pullup airspeed. The initial climb airspeed bleed rate is governed by pitch attitude. The pullup should be identical for all your climb entries, a 2g pullup works well for mil power climbs. For your first climb entry, try initiating the pullup at 5 kts below the 4,000 ft speed and pull to 9°-17° pitch. The airspeed should accelerate to 457 to 460 KCAS during the pullup; however, a bleed rate will be established so that 454 KCAS is reached at 4,000 ft PA. If the initial airspeed or bleed rate is not as desired, change

the pullup airspeed or final pitch attitude on subsequent entries. If the first entry is poor, abort the climb and try again; a mil or max check climb aborted early will prevent wasting fuel on bad data.

e. Maintain the climb schedule by controlling airspeed bleed rate with pitch. Hold a specific pitch attitude constant until the bleed rate is identified, then make a precise pitch attitude change, if a bleed rate change is desired. Pitch attitude should be held constant between the specific changes you initiate. Wind shears or temperature gradient changes will require pitch changes to hold the proper bleed rate. If the bleed rate suddenly changes with a constant pitch attitude, change the pitch to control the bleed rate. Airspeed should be checked passing through designated altitudes, and the bleed rate modified accordingly. When climbing through the tropopause, anticipate a significant nose down pitch change.

f. When off the schedule, correct back smoothly, rather than with large or abrupt pitch changes. The bleed rate should never stop or reverse.

g. Tolerance: ±2 KCAS.

6. <u>Penetration Check Descent, IP Demo.</u>

IP: Demonstrate a penetration check descent from 20,000 ft to 14,000 ft PA using 70% rpm, speed brakes-out, and 300 KCAS.

a. The data record switch should be turned on before reaching 20,000 ft and off after passing 14,000 ft PA. Event at the beginning and end of the altitude band, and when off schedule.

b. Establish the descent at least 2,000 ft above the desired data band. Trim the aircraft if required.

c. Insure that the throttle is at 70% rpm.

d. Tolerance: ±2 KCAS.

7. <u>Maximum Range Check Descent, IP Demo.</u>

IP: Demonstrate a maximum range check descent from 12,000 ft to 6,000 ft PA using idle rpm, clean, and 210 KCAS.

a. Data: As in paragraph 6.a.

b. Establish the descent at least 1,000 ft above data band. Trim if required.

c. Tolerance: ±2 KCAS.

8. <u>Mil Power Check Climb, Student Practice.</u>

Pilot: Perform a mil power check climb.

a. Data Band: 5,000 ft - 30,000 ft PA.

b. Simulate all data procedures on this and subsequent maneuvers.

9. Penetration Check Descent, Student Practice.

Pilot: Perform a penetration check descent.

Data Band: 30,000 ft - 23,000 ft PA.

10. Trim Shot, Student Practice.

Pilot: Perform a stabilized trim shot at 25,000 ft PA and 350 KCAS.

Data band: ±2 KCAS, ±100 ft.

11. Mil Power Stabilized Turn, IP Demo.

a. IP: Demonstrate a mil power stabilized airspeed level turn at 25,000 ft PA, 350 KCAS.

(1) Entry Techniques. During this mission, the IP will demonstrate and the student will practice two stabilized airspeed entry techniques. The first technique is similar to entering a steep bank turn under instrument conditions. The maneuver is initiated from a trim shot at the test altitude and airspeed. Throttle, bank angle, and back stick pressure are blended together to stabilize on the test condition in a smooth manner. The second technique is to start on the test altitude and 10-30 knots below the test airspeed. The appropriate thrust setting is then selected and a level acceleration is performed. Approaching the test airspeed, the bank angle and back pressure on the stick are smoothly increased to stabilize on the test condition. This technique is best for performing a maximum power stabilized turn as the airspeed buffer allows for the afterburner light and staging, which can be abrupt and cause the pilot to get behind in applying sufficient stick force to maintain the test airspeed. It is significantly easier to increase airspeed by relaxing back stick pressure to obtain the test airspeed, than it is to reduce the airspeed using increasing back stick pressure (which requires a high load factor). If the airspeed gets too high in a max power turn, reduce power (but remain in afterburner) until back on condition, then increase the power to max. Insure that the throttle friction is set high enough to preclude throttle movement due to load factor (but low enough to allow movement by the pilot).

(2) Procedure. During the turn, altitude is controlled by pitch attitude through changes in the bank angle. Airspeed is held constant with back stick pressure. On the back side of the load factor versus airspeed curve, constant airspeed will be maintained with back pressure. Use the HUD horizon line and flight path marker to assist in altitude control, and use HUD g-meter, airspeed and altitude information to maintain the test condition. Attempt at least one maneuver with the HUD ATT/FPM and VAH switches off so that cockpit instruments and outside references must be used. Load factor will still be indicated in the HUD.

It is important to note that turn performance data collection methods require the same techniques to stabilize at $P_s = 0$; the difference is only in the data acquisition. For the stabilized turn method, airspeed and g are read directly off the instruments. Recording stabilized g and stabilized airspeed is accurate for load factors above approximately 2.0g with a sensitive g-meter, and provides many data points per maneuver. The timed turn method is most applicable at low load factors or when sensitive g-meter or DAS recordings are not available. The timed turn method uses the relationship between true airspeed, turn rate, and load factor to take two measurable values (true airspeed and turn rate) to compute load factor. It is nothing more than an alternate method to determine the load factor. With airspeed, altitude and load factor constant, time the aircraft through 360° of turn. Use the aircraft heading indicator or outside reference to determine 360°. Record H_i, V_i, T_i, fuel remaining, DAS times, and time to turn. Since g is not recorded directly, true airspeed and time to turn are used to find g. Timed turns can also be accomplished at various test conditions to check the calibration of the g-meter.

b. IP: Demonstrate a series of mil power stabilized load factor level turns at 25,000 ft PA and n_z = 1.5, 2.0g.

(1) Entry Technique. Accelerate in mil power to V_{max}. Record this mil V_{max} and roll to slightly more than a 45° bank to obtain 1.5g, maintaining level flight. Allow the airspeed to stabilize and, after 10 seconds of stabilization, event the DAS and record V_i, H_i, load factor, T_i, fuel remaining and DAS time. Increase load factor to 2.0g, increasing bank as required to maintain level flight and allow the airspeed to stabilize again. After 10 seconds, repeat the data recording procedure outlined above. (Note: While stabilized airspeed turns work well at all speeds, the stabilized load factor turns are best performed only on the front side of the airspeed versus load factor curve).

(2) Procedure. With the stabilized load factor technique, bank angle and back stick pressure coordination requirements are similar to that of constant airspeed turns. Due to the steep slope often found on the front side of the g vs airspeed curve, expect small airspeed decrements for g increments. This technique becomes difficult as you approach the peak of the curve.

c. Data band: ±4 KCAS, ±500 ft.
Tolerances: ±2 KCAS, ±100 ft, ±100 ft/min, ±0.2g.

12. Mil Power Stabilized Turn, Student Practice.

Pilot: Perform mil power stabilized airspeed turns at 25,000 ft PA, 250 KCAS and 300 KCAS and mil power stabilized load factor level turns at 25,000 ft PA and $n_z = 1.5$, 2.0, and 3.0. Simulate all data procedures. Practice both entry techniques. Roll out of one turn and perform an accelerating entry for the next point.

13. Max Power Stabilized Turn, Student Practice.

Pilot: Perform a max power stabilized turn at 25,000 ft PA, 350 KCAS.

14. Mil Power Stabilized Turn, Student Practice.

Pilot: Accelerate to mil V_{max} at 20,000 ft PA and then obtain turn performance data at 2.0, 2.5, and 3.0g. On the back side, obtain data at 230, 300, and 370 KCAS. Time turns at 230 and 300 KCAS. Record the indicated g and airspeed at all test points.

15. Penetration Check Descent, Student Practice (Speed Brakes - In).

Pilot: Perform a speed brakes-in penetration check descent using 70% rpm and 300 KCAS.

Data Band: 25,000 to 15,000 ft PA.

Tolerance: ±2 KCAS.

16. Max Range Check Descent, Student Practice.

Pilot: Perform a max range check descent.

Data band: 14,000 ft to 7,000 ft PA.

Tolerance: ±2 KCAS.

17. Spot Landing.

Pilot: Perform an 11° AOA approach and spot landing.

Data band: on speed ±3 KCAS.

Tolerance: ±500 ft.

18. Ground Block.

Pilot: Record a performance ground block prior to engine shutdown.

19. Debriefing.

Pilot: Critique data quality for all test points.

IP: Critique all maneuvers.

INSTRUMENTATION:

Stopwatch.

DATA REDUCTION/REQUIRED PLOTS:

Prior to the debrief, plot the raw data (n_z versus V_i) for the 25,000 ft PA points. Calculate the n_z for the two timed turn points at 20,000 ft PA and compare these data with the indicated load factor from the HUD or cockpit g-meter.

TURN PERFORMANCE FTT PRACTICE (PILOT)

REFERENCES:

1. Performance Phase Textbook, Chapter 9, Energy.

2. Aircraft test plan.

PURPOSE:

To practice turn performance flight test techniques.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

Individual data group test plan limitations will apply.

MISSION EVENTS:

Two student pilots or one student pilot and student FTE/NAV will fly together. The student pilots will have an IP in the appropriate aircraft approve a mission that will enable the students to improve their proficiency in turn performance flight test techniques. The front seat pilot will be the aircraft commander. The back seat pilot or FTE/N may be from another data group. If convenient, a DAS-equipped aircraft will be made available.

INSTRUMENTATION/DATA REDUCTION/REQUIRED PLOTS:

None.

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TURN PERFORMANCE DATA (PILOT, FTE/N)

REFERENCES:

1. Performance Phase Textbook, Chapter 9, Energy.

2. Aircraft test plan.

PURPOSE:

The student aircrew will collect level, sustained turn performance data for the Limited Performance Evaluation Report. Students will also gather thrust available propulsion system data.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

As per applicable test plans.

MISSION EVENTS:

1. Mission Preparation.

Individual data mission requirements will be assigned by the test team leader based upon the applicable test plan.

2. Briefing, Ground Operations, and Takeoff.

Accomplish in accordance with standard operating procedures and previously demonstrated FTTs.

3. Climb.

Pilot: Perform a check climb as assigned by the test team leader.

4. Turn Data.

a. Pilot: Gather sustained turn data as assigned. For mil power turns, use both the stabilized turn and timed turn methods (both may be accomplished on the same data run). For max power turns, only the stabilized turn method is allowed to conserve fuel and minimize asymmetric G conditions.

b. At low altitudes/max power, turns may be load-factor limited. If the aircraft accelerates at the test plan limit, allow the airspeed to increase until a stable point is reached. DO NOT EXCEED THE TEST PLAN LIMIT.

c. At low altitude/low speed, turns may be lift limited. If the aircraft decelerates, terminate the maneuver at the test plan limit.

Record load factor, T_i, and indicated airspeed for these conditions. These data may be hand-reduced to find lift-limited turn rate and radius.

INSTRUMENTATION:

1. Mag tape DAS - not required, but may be used if installed.

2. Stopwatch.

3. Hand record load factor or time for 360° of turn, H_i, V_i, T_i, and fuel.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

CHECK CLIMB/CHECK DESCENT DATA (PILOT, FTE/N)

REFERENCE:

1. Performance Phase Textbook, Chapter 9, Energy.
2. Aircraft test plan.

PURPOSE:

To perform check climbs to determine time, fuel, and distance to climb, using various climb schedules, for inclusion in the Limited Performance Evaluation Report.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

See applicable test plan.

MISSION EVENTS:

1. Check climb and check descent tests will be conducted in conjunction with other data gathering missions.

2. In each data group, at least one check climb will be flown for each of the following climb schedules as determined from level acceleration or sawtooth climb data.
   a. Flight manual recommended schedule.
   b. Maximum rate of climb schedule from data analysis.
   c. Optimum energy schedule from data analysis.
   d. Data group recommended schedule from data analysis.

3. Additional climb schedules may be flown as desired by each data group. Since level accel climb data may not be available until later in the phase, it is a good idea to get flight manual recommended climb data as soon as possible.

INSTRUMENTATION:

The mag tape DAS, if available, will be used to record data. Use the event function to mark the point in the climb where good, stabilized data begin, where data are poor, and where the climb terminates.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

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AERODYNAMIC MODELING DEMO (PILOT)

REFERENCE:

1. Performance Phase Textbook, Chapter 14, Aerodynamic Modeling.

2. T-38 Flight Manual.

3. AFFTCR 55-2.

PURPOSE:

To demonstrate and practice the flight test techniques used in the collection of lift and drag data at constant Mach number (airspeed) through stabilized and dynamic aero modeling maneuvers.

AIRCRAFT:

T-38A.

LIMITATIONS:

As per aircraft flight manual.

MISSION EVENTS:

1. Mission Preparation.

Pilot: Prepare flight cards, including the items defined in this briefing guide. Data cards should include DAS time, run and event number, and fuel at the start and completion of each maneuver. Review the pitot-static corrections required to fly the transonic test points in the proper altitude bands. Review the T-38 Flight Manual, Section VI, noting the supersonic flight envelope and dive recovery requirements that may pertain to supersonic test points.

2. Briefing.

Pilot: Brief items in the general briefing guide and the flight profile.

IP: Brief the specific techniques for:

- a. Stabilized methods
  - -Constant Altitude
  - -Descending Turn
- b. Dynamic methods
  - -Roller Coaster
  - -Windup Turn
  - -Split-S Maneuver

Note: Data procedures are mentioned to reinforce good habits; no actual data is required for this flight.

3. Ground Block.
Pilot: Accomplish a performance ground block (hand record and DAS).

4. Takeoff.
Pilot: Perform a max power takeoff. If assigned to the T-38A data group, record the takeoff data for the Limited Performance Report.

5. Mil Power Check Climb, Student Practice.
Pilot: Make a mil power TPS schedule check climb from 5,000 to 25,000 ft. PA.

6. Trim Shot, Student Practice.
Pilot: Perform a trim shot at 25,000 ft PA, 0.8 Mach, stable for 10 seconds. This is the target condition for the subsonic stabilized and dynamic methods presented in the following paragraphs.

7. Stabilized Methods, IP Demo.

a. Stabilized methods provide aerodynamic modeling techniques for aircraft with limited instrumentation. They also provide a useful cross check for data collected during dynamic maneuvers, since they are not influenced by dynamic effects.

b. Constant Altitude:

(1) This method involves stabilizing at different bank angles (load factors) to collect data for various C_L values at a constant altitude. Techniques used are very similar to gathering turn performance data, except the power is changed to hold a desired Mach number (airspeed) and load factor rather than just setting power and determining to what airspeed the aircraft decels/accels.

(2) The first point is at 1g ($\Phi = 0$), a straight and level trim shot. Run the DAS and hand record Mach number, load factor, altitude, bank angle, pitch angle, and engine speed (primary engine parameter, i.e. N_1, N_2, EPR, PLA, etc.). Turn off the DAS between points to save tape; DAS recording is only required for the 10 seconds of stable data. Following the 1g point, adjust power, bank angle, and pitch as required to stabilize at 2Gs ($\Phi = 60$); once stable, record data as in the 1G point. If time allows, demo a 3g point; however, depending on atmospheric conditions and aircraft weight, minimum afterburner may be required to stabilize at this point.

(3) Data band: ±500 ft, ±0.01 Mach, stable for 10 seconds.

c. Descending Turn:

(1) The descending turn technique provides data at higher load factors than the level turn method in power limited situations. Pitch and bank are adjusted to maintain desired Mach number as load factor is increased to each trim point. Data required is as in the constant altitude method with the addition of descent rate, the major difference is that no power adjustments are made at the various data points.

(2) Refine the trim shot performed for the previous 1g maneuver; note power setting and do not adjust the trim. Climb to 2,000 ft above the target altitude, reset to trim power, and enter a descending turn to stabilize at 2g. Once stable, and entering the 1,000 ft data band, record DAS and handheld data as before. Keep the DAS running, stabilize at 3g, and record data if still in the 1,000 ft data band. If outside the data band, climb back up to 2,000 ft above target altitude, reset trim conditions, and obtain the 3g point. Do the same for 3.5g or moderate buffet.

(3) Data band: ±1,000 ft, ±0.01 Mach, stable for 10 seconds.

8. Stabilized Methods, Student Practice.

The student should practice both stabilized methods using the same target parameters as in item 7.

9. Dynamic Methods, IP Demo.

a. Roller coaster:

(1) The roller coaster maneuver is a smooth sinusoidal variation of load factor versus time. The throttle is kept constant during the maneuver. From trimmed flight, the maneuver begins with a pushover to 0g and is followed with a pullup to 2.0g, and then back to trimmed 1g flight. Onset rates are in the neighborhood of 0.25 to 0.5g per second, with the maneuver taking 8-16 seconds. The slower rate will produce larger Mach variations but will also produce smaller rate effects on the data. The Mach variation is usually no more than 0.01 and the altitude variation is less than 500 ft. Simulate data procedures using the DAS, noting fuel and time.

(2) Refine the trim shot at 0.8 Mach, 25,000 ft. PA and demonstrate the roller coaster maintaining Mach within tolerances. Actual engineering requirements may dictate different onset rates but stress maintaining wings level flight and achieving smooth onset rates; hitting the exact load factor band is not as important as smooth onset rates. Stow all loose items for the dynamic maneuvers.

(3) Data band: ±1,000 ft, ±0.01 Mach

b. Wind-up turn:

(1) The wind-up turn begins wings level trimmed at target conditions. The aircraft is gradually pulled into a descending turn, smoothly increasing bank while maintaining Mach, to produce up to a maximum of 1.0g/sec load factor onset rate, until a limit condition is reached (maximum g/AOA/etc.). In the T-38, a slight nose low pitch attitude and roll must be started before increasing the load factor to initially avoid airspeed (Mach) loss. As load factor is increased, the roll and pitch continue to change to maintain Mach.

(2) Climb to 26,000 ft PA and 0.8 Mach and refine the trim shot. Perform a wind-up turn to 4g or moderate buffet staying within the +/-1,000 ft altitude band. Consider local terrain elevation for recovery as near vertical pitch attitudes can develop by the end of the maneuver. Watch asymmetric g limits on recovery and check flight manual dive recovery altitudes.

(3) Data band: ±1,000 ft, ±0.01 Mach

c. Split S:

(1) A split-s, or inverted pull-up, is a maneuver suited to gathering data for fighter type aircraft. Trim the aircraft at the aim condition, start the DAS, and roll inverted. Pause momentarily to allow realignment of attitude indicators/sensors, then smoothly increase load factor at approximately a 1g/sec to 3g/sec onset rate until limit conditions are reached. Maintain Mach and concentrate on a good wings level pull. Normally data is obtained in the first 45 degrees of pitch down. Once limit conditions are reached, unload, roll upright wings level, and recover from the dive. Continuing the split-s all the way through is not a recommended technique due to altitude losses involved, especially at supersonic test points.

(2) Refine the 0.8 Mach and 26,000 ft PA trim shot and demonstrate as mentioned above. Watch flight manual airspeed and g limits during the pullout.

(3) Data band: ±1,000 ft, ±0.01 Mach

Note: Additional instrumentation required for dynamic maneuvers includes accelerometers and a data acquisition system. Since data is required at up to 10 samples/second, handheld data is not applicable.

10. Dynamic Methods, Student Practice.

The student should practice the three dynamic methods using the same target parameters as in item 9.

11. Dynamic Methods, Student Practice.

If fuel allows, the student will practice the three dynamic methods at M = 1.05 and 30,000 ft PA. Coordinate entry into the Black Mountain supersonic corridor and pay particular attention to flying attitude during the transonic portion of the setup. Check pitot-static correction errors prior to flight. While performing the split-s maneuver, the aircraft will normally achieve 5 to 6g and end with about a -45 to -60 degree pitch attitude. Be prepared for the high speed dive recovery - unload, roll upright to wings level, and use a 4 to 6g recovery. Flight manual airspeed limit at 30,000 ft is about 1.6 Mach and 1.4 Mach at 15,000 ft (normally maximum Mach number is about 1.2); altitude loss during dive recovery is 4,000 to 10,000 ft depending on technique. Watch rolling load factor limits during all maneuvers. Review Section VI of the flight manual before flight.

12. RTB - Spot Landing

Perform a spot landing, ±300 ft, ±3 KIAS.

13. Ground Block

Perform a performance ground block.

INSTRUMENTATION/DATA REDUCTION/REQUIRED PLOTS

None.

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AERODYNAMIC MODELING FTT PRACTICE (PILOT)

REFERENCE:

1. Performance Phase Textbook, Chapter 14, Aerodynamic Modeling.

2. Aircraft flight manual.

3. AFFTCR 55-2.

PURPOSE:

To practice the flight test techniques used in the collection of lift and drag data at constant Mach (airspeed) through stabilized and dynamic aero modeling maneuvers.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

As per aircraft flight manual and data aircraft test plans.

MISSION EVENTS:

Practice aero modeling techniques as taught in the FTT. Insure the crew brief emphasizes aircraft limits and appropriate safety considerations - the FTE/Ns may not have seen these techniques prior to this flight.

INSTRUMENTATION/DATA REDUCTION/REQUIRED PLOTS

None.

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AERODYNAMIC MODELING DATA (PILOT,FTE/N)

REFERENCE:

1. Performance Phase Textbook, Chapter 14, Aerodynamic Modeling.

2. Aircraft flight manual.

3. AFFTCR 55-2.

PURPOSE:

To collect of lift and drag data at constant Mach number (airspeed) through stabilized and dynamic aero modeling maneuvers.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

As per aircraft flight manual and data aircraft test plans.

MISSION EVENTS:

Gather lift and drag data. Insure the crew brief emphasizes aircraft limits and appropriate safety considerations.

INSTRUMENTATION:

DAS will be used to record data.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

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PERFORMANCE DEMO (FTE/N)

REFERENCE:
Performance Demo (FTE/N) Mission Card/Grade Sheet.

PURPOSE:
1. To allow the student FTE to practice his mission planning, briefing, and data card preparation techniques. During the flight, the student FTE/N will perform "starred items" on the card after demonstration by the IP. The flying of the "starred" items allows the FTE to gain an appreciation and understanding of the maneuver and pilot workload. Plan the mission to fly all the items on the card.

2. To allow the instructor pilot to provide feedback to the student on his mission planning, briefing techniques, and data cards. The IP may elect to modify the student's profile. During the flight, the IP will explain and demonstrate methods and techniques used in performance testing.

AIRCRAFT:
T-38A.

LIMITATIONS:
None.

MISSION EVENTS:
1. Mission Preparation.
FTE/N: Plan the profile using a fuel/altitude time line. Prepare mission cards for himself/herself and the IP. Prepare one set of data cards for each type of FTT flown: check climb/descent, level accel/decel, sawtooth climbs, aero modeling, and turn performance for the IP to review and critique.

2. Briefing.
FTE/N: The FTE/N will brief the specific mission if he/she has received the FTT for the respective demonstration points. If he/she has not received the FTT, the IP will brief and discuss the appropriate test technique. This may occur because the flight is scheduled early in the Performance Phase.
IP: Stress crew coordination, backing up the pilot on aircraft limits and data on/off calls, flexibility, and insure a priority of mission events is established.

3. Flight.

FTE/N: The FTE/N will observe as the IP demonstrates and explains the different FTTs. As a means to gain an understanding of the FTT and resulting pilot workload, the FTE/N will attempt those items designated for student practice on the gradesheet. The FTE/N will not be graded on his or her flying ability. However, the FTE/N will be expected to make in-flight decisions concerning the priority of accomplishing, deleting and/or reattempting mission events.

4. Debriefing.

IP: The IP will debrief the mission with emphasis on the mission planning, data cards, situation awareness, and data analysis.

INSTRUMENTATION/DATA REDUCTION:

None.

PERFORMANCE MID-PHASE PRACTICE (PILOT)

REFERENCES:

1. Performance Phase Textbooks.

2. Performance Phase Planning Guide.

PURPOSE:

To practice various flight test techniques in preparation for the performance mid-phase check ride. Each pilot will receive one front seat sortie.

AIRCRAFT:

T-38A.

LIMITATIONS:

As per the T-38A Flight Manual, the Performance Phase Planning Guide, and appropriate safety limitations (see Appendix B).

MISSION EVENTS:

The student test pilot will plan and fly a practice mission that may include any flight test technique previously demonstrated as part of the curriculum. The flight card will be approved by a TPS graduate T-38 IP. This sortie will be flown within a one week period prior to the performance mid-phase check ride.

INSTRUMENTATION/DATA REDUCTION/REQUIRED PLOTS:

None.

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PERFORMANCE MID-PHASE CHECK RIDE (PILOT) (GRADED MISSION)

REFERENCE:
Performance Phase Textbook.

PURPOSE:
To demonstrate proficiency in flight test techniques previously demonstrated and practiced.

AIRCRAFT:
F-15/T-38A(Backup).

LIMITATIONS:
If the F-15 is configured with a centerline fuel tank, be on initial with 5,500 lbs of gas for fuel planning purposes.

MISSION EVENTS:
NOTE: Second parameter for each event (in parenthesis) is for the T-38A.

1. Mission Preparation.
Pilot: Plan the sequence of events and prepare the data cards. Assume that your airplane has a mag tape DAS for test points which require it.

2. Briefing.
Pilot: Complete general and specific mission briefings. Discuss each test point, including data requirements, applicable limitations, and tolerances.

3. Ground Block.
Pilot: Accomplish a performance ground block.

4. Takeoff.
Pilot: Record takeoff roll, V_i, fuel, winds, temperature, and pressure altitude for a normal mil (max) power takeoff.

5. Mil Power Check Climb.
Pilot: Make a mil power check climb, using the flight manual (TPS) climb schedule.
Data band: 5,000 to 20,000 ft PA.
Tolerance: ±2 KIAS.

6. Penetration Descent.

Pilot: Make a penetration descent with 72% (80%) rpm, 300 KIAS, speed brake out.

Data band: 20,000 to 10,000 ft PA.

Tolerance: ±2 KIAS.

7. Max Power Check Climb.

Pilot: Make a max power check climb using the flight manual (TPS) Climb Schedule.

Data band: 5,000 to 30,000 ft PA.

Tolerance: ±5 KIAS.

8. Trim Shot.

Perform a trim shot at 35,000 ft PA, 300 KIAS.

Data band: ±2 KIAS, ±100 ft.

Tolerance: ±2 KIAS from stable airspeed for 10 seconds.

9. Max Power Level Accel.

Pilot: Perform a 1g max power, level acceleration at 35,000 ft PA, 0.9 Mach (250 KIAS) to 1.3 (1.1) Mach. This maneuver is for performance data, so trim is optional.

Data band: ±500 ft.

Tolerances: ±100 ft/min and ±100 ft until transonic; thereafter, ±1000 (500) ft.

10. Mil Power Loaded Level Decel.

Pilot: Perform a 4g mil power level deceleration from 1.3 (1.1) to 0.8 (0.9) Mach number at 35,000 ft PA.

Data band: ±500 ft.

Tolerances: ±0.2 g, ±1000 (500) ft.

11. High Speed Descent.

Pilot: Make a high speed descent, idle, 0.8 (0.84) Mach, speed brake out.

Data band: 30,000 to 15,000 ft PA.

Tolerance: ±0.02 Mach.

12. Mil Power Loaded Level Accel.

Pilot: At 23,000 (20,000) ft PA, perform a 2g mil power level acceleration from 250 (300) KIAS to 0.85 (0.9) Mach number.

Data band: ±500 ft.

Tolerances: ±100 ft, ±100 ft/min, ±0.2g.

13. Idle (Mil) Power Loaded Level Decel.

Pilot: At 23,000 (20,000) ft PA, perform a 3g idle (mil) power level decel from 0.85 (0.9) Mach to 250 KIAS (a stable point -- $P_s = 0$. Note this speed, then retard throttles to idle and decelerate at 3g to moderate buffet or 0.7 units/9 degrees AOA).

Data band: ±500 ft.

Tolerances: ±100 ft, ±100 ft/min, ±0.2g.

14. Max Range Descent.

Pilot: Make an idle 220 (240) KIAS descent.

Data band: 20,000 to 10,000 ft PA.

Tolerance: ±2 KIAS.

15. Trim Shot.

Pilot: Perform a PA (cruise) configuration trim shot at 10,000 ft PA, 21 AOA (180 KIAS), and full speed brake (speed brakes closed in T-38).

Data band: establish AOA and determine proper airspeed, then maintain ±2 KIAS of that airspeed, ±100 ft.

Tolerance: ±2 KIAS, stable for 10 seconds.

16. Mil Power Level Accel (T-38 Only).

Pilot: Perform a 1g mil power level acceleration at 10,000 ft PA from 200 KIAS to 0.9 Mach.

Data band: ±500 ft.

Tolerances: ±100 ft, ±100 ft/min.

17. Turn Performance (F-15 Only).

Pilot: Perform a 4g mil power turn performance point (3g with a centerline tank) at 18,000 ft PA. Accelerate to V_{mil}, set the load factor, and then determine the stable airspeed.

Data band: ±500 ft.

Tolerances: ±100 ft, ±100 ft/min, ±0.2G.

18. Turn Performance (F-15 Only).

Pilot: Perform a mil power, 250 KIAS level turn at 18,000 ft PA and determine the sustained load factor.

Data band: ±500 ft.

Tolerances: ±2 KIAS, ±100 ft, ±100 ft/min.

19. Tower Flybys.

Pilot: Perform two tower flybys (one T-38A) at the following conditions:

a. CR, 350 KIAS (F-15 only).

b. PA, 180 KIAS.

Data band: ±5 KIAS of aim, 50-150 ft AGL, stable.

20. Spot Landing.

Pilot: Make a spot landing from an overhead or closed pattern.

Data band: on speed ±3 KIAS.

Tolerance: ±300 ft.

21. Ground Block.

Pilot: Accomplish a performance ground block.

22. Debriefing.

Pilot: Critique each maneuver and data quality.

IP: Critique pilot performance.

INSTRUMENTATION/DATA REDUCTION/REQUIRED PLOTS:

None.

NOTE: ALL ITEMS ON THIS FLIGHT WILL BE GRADED.

CRUISE DATA (PILOT, FTE/N)

REFERENCES:

1. Performance Phase Textbook, Chapter 11, Cruise.

2. Aircraft Test Plan.

PURPOSE:

To use the speed power method to gather cruise data, and to gather thrust available propulsion system data.

AIRCRAFT:

Data group aircraft.

LIMITATIONS:

T-38A minimum airspeed above 25,000 ft PA is 230 KIAS.

T-38 ENGINE FLAMEOUT DISCUSSION.

1. The results of an investigation by a team comprised of representatives from Safety, Maintenance, and TPS, concluded that a trend in increased T-38 flameouts was not the result of operator factors. The Test Pilot School historically experiences a significant increase in T-38 flameouts during W/δ missions. The reasons for this increase in flameouts become evident when we look at the T-38 Flight Manual, Section VII.

2. During the W/δ mission, the pilot will find himself operating in the black striped area of the T-38 engine envelope as described in the Flight Manual, Section VII. Operation in this area requires very slow throttle movement to avoid an engine flameout. Experience has shown that any movement of the throttle while operating in the black striped area is capable of inducing an engine flameout even if all published procedures are adhered to. An additional problem is the uncertainty of the dimensions of the black striped area due to the fact that temperatures colder than standard increase the size of the black striped area, and also that the envelope presented is only for 1g flight. Bank angles as little as 15° can cause a flameout at altitudes above 40,000 ft PA. What all this means to us is that flameouts are inevitable, but there are some things we can do to minimize their occurrence.

3. The first thing we can do is have a thorough understanding of Section VII of the T-38 Flight Manual. Secondly, understand the fact that a 1 percent change in engine

rpm can result in a 20 KIAS change, which implies that we should minimize our throttle movements for slowing down and utilize speed-brakes or exchange altitude for airspeed, and once on our desired speed make a throttle change to stabilize the aircraft. For planning purposes, W/δ airspeeds should be flown in a decreasing order. The reason for this is that engine stalls/flameouts are more susceptible at low speeds and advancing throttles due to reduced/distorted ram air flow to the engine. Finally, when looking at 1g flight flameout statistics over two years, 20 of 27 flameouts were at airspeeds less than 230 KIAS. If we limit ourselves to flying no less than 230 KIAS and apply a few precautions while flying W/δ missions, we should significantly reduce our flameout occurrences and still be able to gather the necessary data to determine range and endurance. In summary, the following techniques are mandatory:

a. Plan your W/δ mission so that the high speed points are accomplished first, followed by the remaining points in order of decreasing airspeed.

b. Exchange airspeed for altitude when possible for each succeeding W/δ point. If still above your desired airspeed while on desired altitude, use speedbrakes to slow down. Do not use g to decrease airspeed.

c. Minimize throttle movements; try to reach your required rpm through one continuous throttle reduction, as opposed to a large rpm reduction to slow the aircraft followed by a large throttle advance to hold your desired airspeed. If you have to advance the throttle, realize that the flight manual note of 1 inch throttle movement in 3 seconds may not be slow enough to avoid flameouts at higher altitudes.

d. After completing the slowest test point, lower the nose and accelerate before moving the throttles.

e. Fly no slower than 230 KIAS above 25,000 ft PA.

GENERAL:

1. The speed-power technique for gathering cruise data is very similar to the trim shot. Cruise data (specifically, fuel flow and thrust required) can be greatly affected by the increased drag resulting from an out of trim condition. Therefore, a good trim shot is critical to gathering valid cruise data. Gathering cruise data can be a time consuming task.

2. An additional key to success is developing a good feel for the amount of fuel required to stabilize. You must ensure that when you finally stabilize, your fuel state is correct for the 2% W/δ tolerance band (0.5% for heavy aircraft) for the altitude you are maintaining. Not allowing enough fuel to establish the trim shot will result in

being too low in altitude for the gross weight; allowing too much fuel will result in being too heavy for the selected altitude.

3. It is helpful to take aboard the aircraft a predetermined graph of permissible altitude and fuel variations that will allow you to stay within tolerances.

4. The basic flight test technique for gathering cruise data is as follows:

a. Determine the most accurate way of measuring fuel flow for your aircraft. This may range from production fuel quantity gages and a stopwatch to instrumented sensitive fuel flow indicators.

b. Level off and start a trim shot at an altitude such that you will be stable when the fuel decreases to within the tolerance band. Initially, allow additional fuel for the trim shot. Then, adjust this "pad" for proficiency and anticipated difficulty or ease of each trim point.

c. For multiengined aircraft, adjust the engines to the same power setting during the trim shot. You will need to determine which engine parameter is the most accurate indicator of engine performance and trim. In many cases, rpm or torque may be used, however, in other cases parameters such as TIT or EGT may be more appropriate. This may cause a slight difference in indicated fuel flow between engines.

d. When stable within the data band, start timing. Data are recorded at regular intervals (usually the initial, the final, and near each 30 second interval) over at least a three minute period to ensure that the minimum of two minutes of continuous accurate data are available. When using digital indicators, you may want to start/stop timing when the counter changes to a new value.

e. Record V_i, T_i, H_i, rpm/torque (and/or selected engine performance parameter), fuel quantity and fuel flow at each selected time interval.

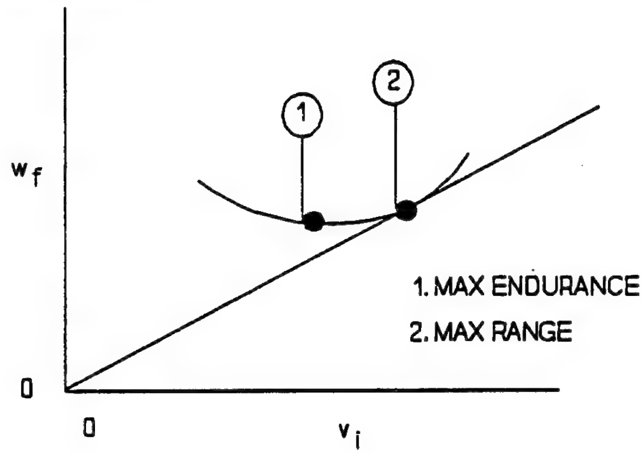
f. Be sure you are stable during timing. A cruise trim point does not have to be completed totally hands off. On front side points, keep altitude constant (±100 ft) with small pitch changes. If airspeed varies more than 2 KIAS during the data period, the point should be repeated. For back side points, keep airspeed constant (±2 KIAS) with small pitch changes. In this case, altitude variations more than 100 feet, or rates of climb/descent in excess of 100 ft/min, indicate that you are not stable.

g. Do not move the throttles during the timing period.

h. Do not change the trim during the timing period. Excessive pilot input, even if within tolerances, may indicate that the aircraft should be retrimmed and the test point repeated.

i. Data band: ±2% W/δ fighter/trainer, ±0.5% W/δ heavy; ±3 KIAS.
Tolerances: ±2 KIAS, ±100 ft, ±100 ft/min, stable for 3 minutes.

j. Make an in-flight plot of $\dot{w}_f$ vs V_i. Use this plot to determine the airspeed range you should concentrate on to obtain data near the maximum endurance and maximum range airspeeds. Recall that these airspeeds may be found from the fuel flow curve as shown below:



k. Fuel permitting, fly additional points to fill in the plot. The last point should be a repeat of the original point. Be prepared to explain any difference between this point and the original point.

l. The test team leader will assign test altitudes from the applicable Limited Performance Evaluation Test Plan.

MISSION EVENTS:

1. Mission Preparation.

Individual data mission requirements will be assigned by the test team leader based upon the applicable test plan.

2. Briefing, Ground Operations, Takeoff, and Climb.

Accomplish in accordance with standard operating procedures and previously demonstrated FTTs.

3. Cruise Data.

   a. Record V_{max} at the test altitude using the following power setting:

      (1) T-38A: mil power

      (2) F-16: mil power

      (3) C-23: MRP as defined in the Limited Performance Test Plan.

      (4) KC-135/C-141: NRT

      (5) F-15: mil power

   b. Record W/δ data at decreasing increments of airspeed to near V_{min}. Use DAS and hand record data for each point.

   c. Keep an in-flight plot of N_i or fuel flow ($\dot{w}_f$) vs V_i.

4. Descent and Landing.

Accomplished in accordance with standard operating procedures and previously demonstrated FTTs.

INSTRUMENTATION:

1. DAS for check climb and cruise data.

2. Stop watch.

DATA REDUCTION AND ANALYSIS:

Refer to data aircraft test plans for specific report requirements.

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PERFORMANCE FINAL DEMO (PILOT, FTE/N)

REFERENCE:

Performance Phase Textbook, Chapter 9, Energy.

PURPOSE:

1. To practice techniques of evaluating multiengine aircraft performance.

2. To practice test team coordination, data collection and evaluation techniques.

AIRCRAFT:

C-23A.

LIMITATIONS:

1. A 60° bank angle limitation will be observed throughout the flight. The minimum airspeed will be 1.1 times the power off stall speed (V_s) in the appropriate configuration.

2. Unless specified otherwise, power settings for all test points will be the lower of 720°C ITT or 3,500 lb ft torque (MRP).

3. The crew must be at the start of the low speed course after 1+30 into the flight.

GENERAL:

One pilot and one FTE/N will comprise the test team and fly with an IP and Instructor FTE/N. The scheduled 1.5 hour sortie will be directed by the test team with minimum participation on the part of the instructor. This sortie provides an opportunity for the team to develop a coordinated effort in evaluating a relatively unfamiliar aircraft. The pilot will occupy the left seat while the instructor occupies the right. The time line is critical. Make every effort to conclude the area maneuvers with sufficient time to allow speed course practice. The traffic pattern demonstrations and practice are not be included in the time allowance.

MISSION EVENTS:

1. Mission Preparation.

Pilot, FTE/N: The test team will bring a sensitive g-meter on the mission and will compute takeoff data (speed, ground run) from the C-23A Flight Manual. Compute fuel, time, and distance for the MRP check climb. Compute expected climb performance for target airspeeds in the sawtooth climb. Determine climb winds for check climbs/descents and sawtooth climbs over the appropriate altitude data band,

and temperature deviation for the cruise point. Compute expected fuel flow for the 10,000 ft PA speed-power cruise point. Prepare mission and in-flight data cards with provisions for plotting level acceleration data and check climb data.

2. Briefing.

a. Pilot: Present the general briefing.

b. FTE/N: Brief the specific mission events with special emphasis on data collection responsibilities, configuration checks, parameters, and tolerances for specific FTTs. Include a review of the flight profile, procedures, and techniques. Do not feel compelled to follow the sequence of mission events as they appear in the following summary.

3. Ground Block.

Pilot, FTE/N: Complete and record a performance ground block.

4. Takeoff.

Pilot, FTE/N: Complete a flaps 4° normal takeoff using Maximum Takeoff Power (MTOP). Record takeoff data.

5. Check Climb, Student Practice.

Pilot, FTE/N: Perform a MRP/1400 prop rpm check climb from 4,000 to 10,000 ft PA. Record check climb data.

6. Cruise Data, Student Practice.

Pilot, FTE/N: Accomplish three-minute cruise test points at 10,000 ft PA, maximum endurance and long range airspeeds with 1400 prop rpm. Record cruise test data.

7. Trim Shot, Student Practice.

Pilot, FTE/N: Perform a trim shot at 10,000 ft PA, 120 KIAS, 1400 prop rpm. Record torque.

8. Timed Turn, Student Practice.

Pilot, FTE/N: Accomplish with 1400 prop rpm selected, at the torque from the previous trim shot plus 250 lb ft. Perform a level acceleration at the new torque setting to define V_{max}. Complete a turn performance evaluation using the 360° timed turn method. Obtain front and backside points and try to define the peak. Do not exceed the 60° bank angle limit.

9. Check Descent, Student Practice.

Pilot, FTE/N: Perform long range descent (150 KIAS, 400 fpm, 1200 rpm), 10,000 to 7,000 ft PA. Record descent data.

10. Level Acceleration, Student Practice.

Pilot, FTE/N: Perform a level acceleration using MRP/1400 prop rpm at 8,000 ft PA. The FTE/N will provide an in-flight acceleration plot for comparison with sawtooth climb data.

11. Sawtooth Climb, Student Practice.

Pilot, FTE/N: Define the airspeed for maximum rate of climb at 8,000 feet PA. Perform a series of sawtooth climbs through an altitude band that approximates a one minute event at airspeeds defined during mission planning. Start by establishing the configuration and conditions for the first sawtooth climb point. The instructor may choose to demonstrate one climb segment. Perform climb with MRP/1400 prop rpm.

a. Establish a buffer altitude below the data band that will allow conditions to stabilize prior to data band entry.

b. Start time entering the lower band. Airspeed should be within ±3 KIAS of V_{aim}, hold airspeed stable within ±1 knot in the data band.

c. Record sawtooth climb data at mid-altitude (8,000 feet PA).

d. Stop timing exiting the upper band.

e. Repeat for other airspeeds to define the best climb. If the climb rate is not as expected from preflight planning, vary the size of the data band to approximate a one minute (no greater than ±500 ft) event. Make an in-flight plot of time-to-climb through the altitude band. The climbs should be in the same geographic area, but need not be repeated in the opposite direction. To discriminate between airspeeds and climb rates, constant airspeed is the key parameter. Even small airspeed scatter can cause significant data error.

12. Loaded Accel/Decel, Student Practice.

Pilot: Perform a 1.4g, MRP/1400 prop rpm loaded level acceleration at 8,000 ft PA. Complete an idle 1.4g level deceleration. Collect and complete an in-flight plot of acceleration and deceleration data.

13. Speed Course Practice, Student Practice.

Pilot: Fly one direction of the low altitude speed course in the cruise configuration, 130 KIAS. If DAGRAG is active, fly a 130 KIAS tower flyby.

14. Traffic Pattern.
IP: Demonstrate a 35° flaps touch-and-go landing.
Pilot: Practice 35° flaps touch-and-go and full stop landings.

15. Ground Block.
Pilot, FTE/N: Complete and record a performance ground block.

16. Debriefing.
Pilot, FTE/N: Identify good and bad data from the flight. Present a comparison of in-flight data and flight manual estimates, as appropriate. Also, discuss the application of the low altitude speed course in air data system calibration testing.

INSTRUMENTATION:
Stopwatch.

DATA REDUCTION/REQUIRED PLOTS:
During the debrief, the test team will calculate the load factor from the timed turn test technique. They will also identify the airspeed for maximum rate of climb from the sawtooth technique and the level acceleration. The flight manual estimates should be compared as appropriate with data from the flight. Bring the in-flight plots to the debrief.

PERFORMANCE FTT FINAL (PILOT, FTE/N) (GRADED MISSION)

REFERENCE:
Performance Phase Textbooks.

PURPOSE:
1. To evaluate each student's ability to operate as an effective test team member during an airborne test.

2. To evaluate each pilot's ability to flight plan before and during the mission. To evaluate his ability to perform a representative cross section of flight test maneuvers, and area plan during the entire mission.

3. To evaluate each FTE/N's ability to perform as a test director on a performance flight test, to include mission planning, flying, analyzing and reporting the results.

LIMITATIONS:
1. Flight manual limitations.

2. 60° bank angle maximum.

3. 2.0 g maximum; 0 g minimum.

4. Minimum speed is 1.1 times the power-off stall speed (V_s).

5. Maximum speed is 250 KIAS.

6. With any engine shut down:
   a. 3-engine V_{MCA} minimum.
   b. Within 20 KIAS of 3-engine V_{MCA}: maintain 5° bank away from the shut down engine.
   c. Between 20 and 25 KIAS of 3-engine V_{MCA}: bank as desired away from the shut down engine; no bank into the shut down engine.
   d. Greater than 25 KIAS above 3-engine V_{MCA}: may bank up to 5° into the shut down engine; bank as desired away from the shut down engine.
   e. Minimum of 5,000 feet AGL or the aircraft-owning command guidance, whichever is higher.

AIRCRAFT:
C-130 A, B, E, or H, as available.

GENERAL:

Pilot, FTE/N:

a. The check rides will begin near the end of the Performance Phase. All data will be hand held and test day results will be presented.

b. Pilot and FTE/N team assignments and scheduled mission dates will be assigned prior to the flight. The test team is encouraged to flight plan together. However, each team member will be individually responsible for briefing all aspects of the mission profile and FTTs. The engineer will prepare six sets of data cards (for himself, the pilot, the C-130 IP, the staff IP, the staff FTE/N, and the duty desk).

c. The pilot will cover the general briefing items and the FTE/N will brief the specific mission profile. The student crew should plan on 20 minutes for their combined briefing. Allow 15 minutes for the C-130 IP to cover appropriate crew procedure items. If the same C-130 IP is scheduled to fly both missions during the day, both student crews will brief prior to the first mission. Crew changes will be made, engines running, or as directed by the C-130 IP.

d. The postflight debrief will be conducted by the FTE/N. The individual written and oral report will be presented by the FTE/N, with the pilot in attendance, to the staff FTE/N that flew the mission. This presentation will be made two working days after the flight, and will not exceed 20 minutes.

e. Flight time will not exceed 1.5 hours from takeoff to first touchdown. While airborne, the FTE/N is the Test Director, and the test will only proceed as he/she directs. Similarly, changes in profile and repeated points shall only occur as approved and directed by him/her. Communication during the test is important, but do not lose sight of who is running this test (i.e., the FTE/N).

f. The actual profile to be flown will be given to each pilot and FTE/N team at the FTT brief a minimum of two days prior to the checkride. The individual altitudes, data bands, and configurations will be assigned on the profile handout.

g. Fuel loads, for planning purposes, are 40,000 pounds for the first sortie and 25,000 pounds for the second; check with the C-130 crew the day prior for their exact requirements.

MISSION EVENTS:

1. <u>Mission Preparation.</u>

Pilot, FTE/N:

a. Plan the mission to accomplish the profile as specified in the handout.

b. Plan to acquire test data using production instrumentation.

c. Bring a sensitive g-meter.

2. Briefing.

Pilot, FTE/N: Complete general and specific mission briefings as detailed above.

3. Ground Block.

Pilot, FTE/N: Accomplish a performance ground block.

4. Takeoff.

Pilot, FTE/N: Record takeoff roll, indicated airspeed, fuel, winds, temperature and pressure altitude for the configuration specified (50% flaps).

5. Check Climb.

Pilot, FTE/N:

a. Accomplish a check climb in the cruise configuration using climb TIT and the flight manual schedule.

b. Record time, distance, fuel used and rate of climb over the 10,000 ft altitude band of your choice.

6. Cruise Data.

Pilot, FTE/N:

a. At the planned and briefed weight to pressure ratio of your choice, accomplish three minute stable points at 120 KIAS and 220 KIAS.

b. Record cruise data for the postflight debrief; assume that instrument calibration errors are zero.

7. Three Engine Sawtooth Climbs.

Pilot, FTE/N:

a. Determine the airspeed for maximum rate of climb at the assigned altitude.

b. Climbs will be accomplished with one outboard engine shut down and feathered, in the assigned configuration (gear - up or down, flaps - 0% or 50%). Assume the feathered engine is the critical engine. Power on remaining engines will be maximum permissible TIT. The climb should be accomplished in wings-level, ball-centered flight.

c. Observe appropriate altitude limits with an engine shutdown.

8. Maximum Range Descent.

Pilot, FTE/N:

a. In the cruise configuration using the flight manual schedule, descend through the 5000 ft altitude band of your choice.

b. Record time, distance, fuel and rate of descent for the postflight debrief.

9. Turn Performance.
Pilot, FTE/N:

a. Accomplish a 180 KIAS stable point; note the indicated torque at the assigned altitude.

b. Add 1000 inch-pounds per engine to the trim torque and accelerate to the maximum level velocity for this power setting.

c. Determine the level sustained turn performance of the aircraft in the cruise configuration. Record airspeed, load factor and time to turn.

10. Level Accel.
Pilot, FTE/N:

a. Accomplish a 1 g level acceleration in the cruise configuration using maximum permissible TIT at the assigned altitude.

b. During the entry, do not allow the aircraft to decelerate below 1.1 times the power off stall speed.

11. Loaded Level Accel.
Pilot, FTE/N:

a. At the assigned altitude, perform a 1.4 g level acceleration in the cruise configuration using maximum permissible TIT.

b. Start the acceleration from a speed no less than 1.1 times the 1.4 g power-off stall speed.

12. Loaded Level Deceleration.
Pilot, FTE/N: At the same altitude assigned in event 11, perform an idle power deceleration maintaining 1.4 g. Terminate the maneuver at 1.1 times the 1.4 g power-off stall speed.

13. Tower Flyby.
Pilot, FTE/N: Perform a tower flyby in the cruise configuration at the assigned airspeed.

14. Landing.
Pilot, FTE/N:

a. Accomplish a normal landing.

b. No landing data is required.

15. Ground Block.

Pilot, FTE/N: Accomplish a performance ground block.

16. Debriefing.

Pilot, FTE/N:

a. As soon as possible after the flight, conduct a debrief emphasizing maneuvers flown and data quality.

b. FTE/N - Accomplish a report to the staff FTE/N as specified above.

17. Overall Performance.

IP, Staff FTE/N: Debrief student overall performance.

INSTRUMENTATION/DATA REDUCTION:

1. All data will be taken from production instruments. V_i and H_i can be assumed to have zero instrument error.

2. The report will be made on hand held test day data.

REQUIRED DATA/PLOTS:

Refer to Section III of the USAF TPS Test Management Phase Guide for the specific individual written and oral report requirements.

NOTE: ALL ITEMS ON THIS MISSION WILL BE GRADED.

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T-38 LOW L/D DEMO (PILOT)
(Standard T-38A)

REFERENCES:

1. "Low L/D Landing Techniques, Maneuver Theory, and Mission Description," Aug 74, USAF Test Pilot School.

2. T-38A Low L/D Mission Data Cards (USAF TPS T-38 Aircrew Aid).

3. USAFTPS Operating Instruction 60-1, "Low L/D in T-38A."

4. Letter Report, "T-38 Low L/D Limited Evaluation", Class 77A, USAFTPS, Dec 1977.

5. AFFTC Regulation 55-2, Vol I, Chapter 6, Para 8-6.

PURPOSE:

To qualitatively investigate low lift-to-drag (L/D) approach and landing profiles that simulate typical unpowered research vehicles and evaluate the effects of thrust, drag, and airspeed on low L/D flight characteristics and energy management.

AIRCRAFT:

T-38A.

GENERAL:

1. The objective of this mission is to familiarize the student with low L/D approach and landing flight characteristics using the T-38A aircraft as an airborne simulator. The profiles flown simulate low L/D landing pattern approaches for typical unpowered research aircraft such as the X-24B and the Space Shuttle. The T-38A in a landing configuration (gear and speed brakes down) is capable of approaching the low L/D ratios of these vehicles in the landing pattern portion of their glide flight profiles. The X-24B in the subsonic landing configuration is flown at L/D ratios that vary from 4.0 at 200 KIAS down to 2.5 at 300 KIAS for a constant 0.5 Mach number approach from 30,000 feet to the runway. Various flap settings are used to control drag. The Space Shuttle approaches are flown at a constant equivalent airspeed of approximately 290 KIAS which equates to a constant L/D and glidepath angle ranging from 14° (L/D = 4) to 27° (L/D = 2), dependent on Shuttle configuration and speed brake deflection. Both the varying L/D (X-24B) and constant L/D (Shuttle) type patterns will be flown on this mission.

2. A number of parameters may be controlled to vary the L/D ratio. Use of a drag device, variations in airspeed, and adjustments to ground track are several options for glide flight landing pattern control. On this mission, thrust, drag, and airspeed will be varied to compensate for changes in altitude, gross weight, and wind to obtain the desired L/D ratios. Variations in ground track are not really L/D adjustments and should be made only as a last resort as correct visual perspectives are lost and touchdown accuracy is decreased.

a. Since the T-38A lacks the control feel and mass characteristics of any specific low L/D vehicle, this mission is essentially a performance simulation only. Although handling qualities simulation is not considered, such factors as simulator aircraft controllability, pilot adaptability, fidelity of simulation, and operational applicability should be considered.

b. For repeatable performance simulation, flight path trajectory (glide angle), ground track, and time-of-flight should be held constant, in spite of changes in simulator aircraft gross weight and wind effects.

c. The particular L/D ratio of any unpowered vehicle defines the flight-path angle as shown in Figure 1. For training and simulation purposes, the simulator aircraft should be matched to the test aircraft's L/D or drag polar at the same equivalent airspeeds. Two primary methods used to obtain the desired L/D are changes in drag and airspeed; both will be investigated on this mission.

NOTE: Assume α_T is negligible and the thrust vector (T) is aligned with flight path and opposite to D.

d. The first method of L/D control is variation in drag. In this case, C_L and the velocity profile remain constant and C_D is varied to adjust to the desired L/D. Since the T-38A must be flown in a set landing configuration to achieve the desired low L/D ratios, thrust (rpm) changes are made to simulate varying drag, and to compensate for changes in aircraft gross weight. Thrust settings are also varied to compensate for changes in altitude. Basically, rpm settings will be increased as gross weight decreases to offset the decreased component of the weight vector down the flight path (see Figure 1). The effect of thrust and drag variations on L/D (C_L/C_D) is shown on the drag polar in Figure 2. A list of approximate thrust settings for a

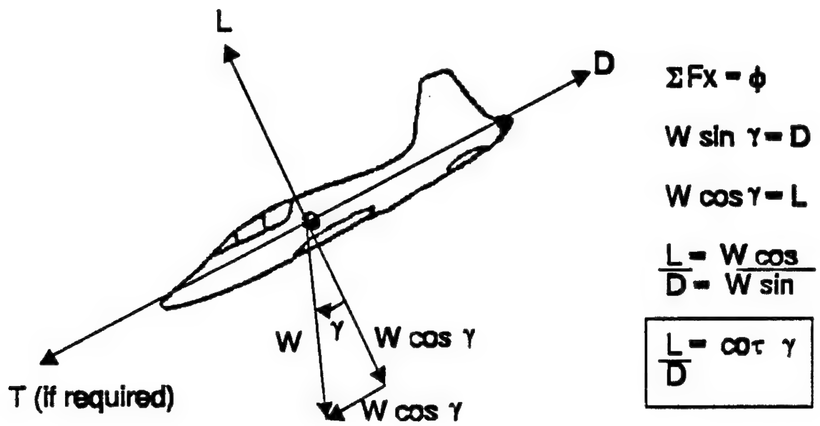

FIGURE 1
FORCES IN GLIDING FLIGHT

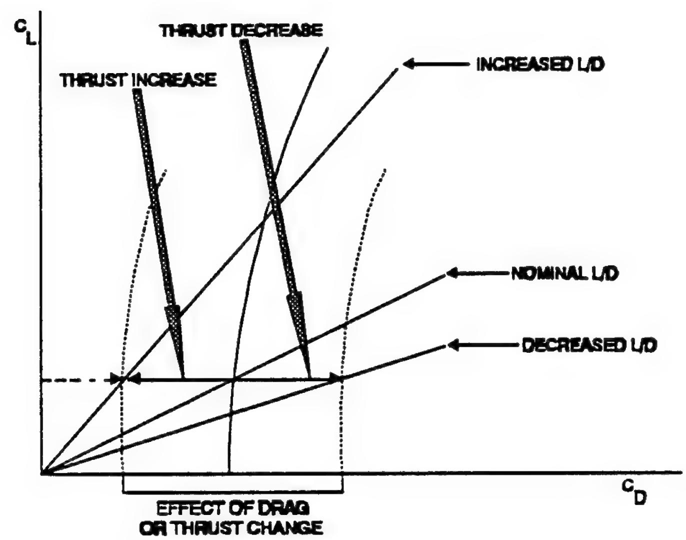

FIGURE 2
T-38A DRAG POLAR OR THRUST CHANGES

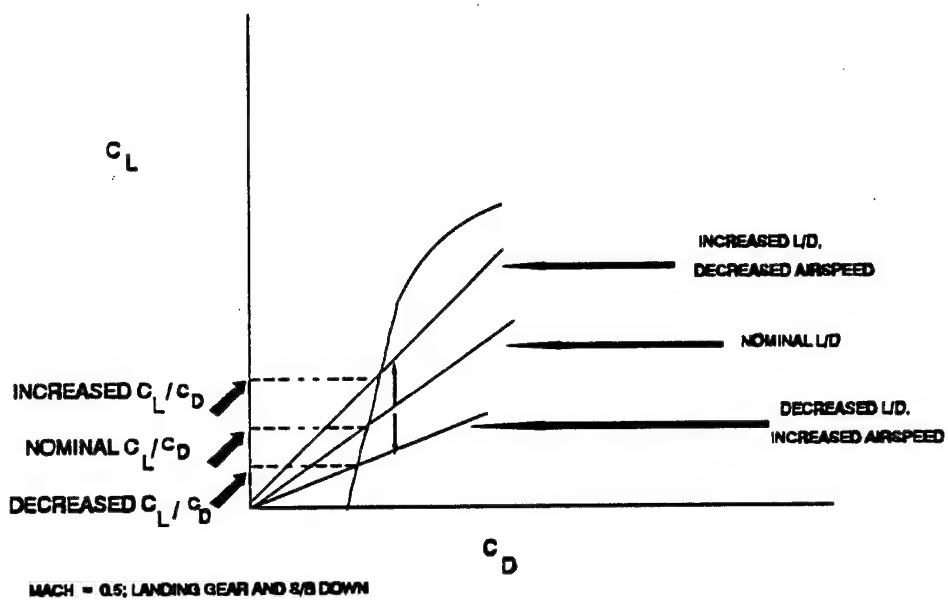

FIGURE 3
T-38A DRAG POLAR AIRSPEED CHANGE

desired L/D at a given altitude and gross weight are provided in the USAF TPS T-38 Aircrew Aid.

e. An alternate method of varying L/D is adjustment of the velocity profile as shown in Figure 3. In this case, airspeed is varied to control L/D instead of changes in drag (thrust for T-38A). For example, as airspeed is increased, less C_L is required, the L/D ratio decreases, and the flight-path angle becomes steeper. This method is easier and more natural, but once the correct glidepath is obtained, another acceleration or deceleration is required to reestablish the original L/D.

3. Two types of profiles will be flown on this mission to demonstrate the effects of thrust, drag, and airspeed on low L/D flight characteristics and energy management. The ultimate objective of any power-off approach is to make a safe landing reasonably close to the desired touchdown point.

a. For the X-24B landing pattern, a constant 0.5 Mach number profile is flown with variations in L/D made by changes in both airspeed and drag (excess thrust for the T-38A). A typical profile with aim airspeeds and altitudes for the nominal flight path is shown in Figure 4. The optimum aim final approach airspeed (280 KIAS) should be roughly between the minimum and maximum airspeeds to allow for fine adjustments to glidepath so as to maintain a constant pre-flare aim point. It also allows for airspeed changes caused by gusts or wind shears. The pre-flare aim point is approximately 8,000 to 10,000 feet from the desired touchdown point at the 10,000 foot remaining marker on Runway 22/04. Minimum airspeed at the flare point is 260 KIAS. The pattern should be flown so that extra altitude must be converted to higher energy on final. Power may be retarded only during the flare to achieve the desired touchdown point; the simulation is no longer valid during the flare/ touchdown. Trim the aircraft during the flare, especially on heavyweight approaches, to eliminate heavy aft stick forces at touchdown.

b. For Space Shuttle approaches, a constant indicated airspeed (varying L/D) profile is flown with the power at idle. Nominal aim airspeed should be 280 KIAS with small airspeed (±20 KIAS) variations allowed for fine glide-path adjustments. Approaches will be flown from a 60° turn onto high final. Nominal profile parameters are shown in Table 1 for different T-38A gross weights. Extra altitude should be allowed to obtain configuration, airspeed, and glide angle prior to reaching the nominal entry altitude. Set the ADI to 0° at 280 KIAS for proper glide angle indication. The high final point is directly over the east shore of the lakebed for Runway 22. The pre-flare aim point is closer to the runway for these steeper approaches and should be approximately 6,000 to 7,000 feet from the desired touchdown point. L/D ratios as low as approximately two are possible in the T-38A with low fuel remaining. A minimum airspeed of 260 KIAS prior to flare is mandatory due to the steeper glide angles and higher descent rates of these approaches. Time and distance from flare to touchdown decreases for actual lower L/D ratios due to a more rapid loss of energy.

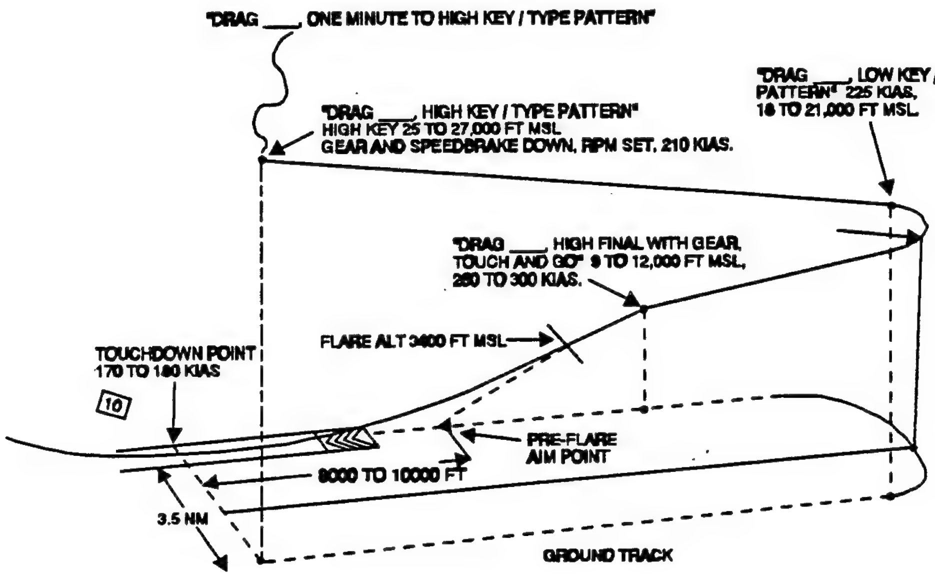

FIGURE 4
T-38A LOW L/D SIMULATION PROFILE

TABLE 1

NOMINAL PROFILE PARAMETERS

SHUTTLE CONSTANT L/D APPROACH-280 KIAS

FUEL WT (at Entry) (lbs)	FLT PATH ANGLE (deg)	LOW KEY ALT (MSL) (ft)	HI FINAL ALT (MSL) (ft)	TYPE ENTRY (deg)	L/D VALUE —
1,600	20°	20.0M	10.9M	60°	2.7
1,250	22°	21.0M	11.5M	60°	2.4
1,000	24°	22.5M	12.2M	60°	2.3
700	26°	25.5M	13.5M	60°	2.1

LIMITATIONS:

1. All Section V flight manual restrictions apply, except the landing gear down and locked limit is extended to 300 KIAS; however, the landing gear must be raised or lowered, and locked at or below 240 KIAS.

2. After each sortie on which low L/D approaches are flown, make the following entry on the AFTO Form 781: "Aircraft was flown up to 300 KIAS with the gear down and locked, gear doors closed."

3. The IP will pull the landing taxi light control circuit breaker (CB) prior to accomplishing low L/D approaches, and reset the CB at termination of all low L/D approaches.

4. Several operational restrictions apply.

a. Runways 04 and 22 will be used for low L/D touch-and-go landings. Touchdown aim point should be the 10,000-foot remaining marker. Go-around should be initiated if touchdown is not made prior to the center taxiway. Except during emergencies, full-stop landings from low L/D approaches are prohibited.

b. Flight path corrections will be discontinued by 7,000 MSL.

c. The flare will be initiated at 3,400 ft MSL (1,100 ft AGL) to arrest sink rate by 100-200 ft AGL. Minimum airspeed at the flare point is 260 KIAS.

d. The aircraft should be below 20 ft AGL by 220 KIAS and 5 ft AGL by 190 KIAS with touchdown below the tire limit of 195 knots (180 KIAS). Minimum touchdown speed will be the same as no-flap approach touchdown speed.

e. Power for go-around will be applied by 180 knots KIAS on low approaches.

f. Radio calls will consist of:

(1) One minute to high key with type of pattern,
(2) High key,
(3) Low key with gear checked,
(4) High final with gear checked, and
(5) On-the-go with intentions.

MISSION EVENTS:

1. <u>Mission Preparation.</u>

Pilot: Obtain wind profile from surface to 30,000 ft PA at 5,000 ft intervals. Review mission data card(s).

2. Briefing.
IP: Discuss theory and mission profile. Use map and point out prominent landmarks. Review limitations.

3. Takeoff and Climb to Entry Altitude.
Suggested optimum climb schedule is 350 KIAS to intercept 0.65 indicated Mach number.

4. Pattern 1 (Nominal X-24B Pattern), IP Demo.
IP: Demonstrate a nominal X-24B low L/D pattern.

5. Pattern 2 (Nominal X-24B Pattern), Student Practice.
Pilot: Practice a nominal X-24B low L/D pattern.

6. Pattern 3 (High Entry X-24B Pattern), Student Practice.
Pilot: Practice using airspeed to adjust back a to nominal X-24B pattern from a 3,000 foot high entry.

7. Pattern 4 (Low Entry X-24B Pattern), Student Practice.
Pilot: Practice using airspeed to adjust back to a nominal X-24B pattern from a 1,500 foot low entry.

8. Pattern 5 (Shuttle Approach), IP Demo.
IP: Demonstrate a nominal shuttle approach.

9. Pattern 6 (Shuttle Approach), Student Practice.
Pilot: Practice a nominal shuttle approach.

10. Pattern 7 (Shuttle Approach), Student Practice.
Pilot: Practice a nominal shuttle approach.

11. Closed Pattern (Normal Full Stop).

12. Debrief.

INSTRUMENTATION:
Tape recorder, if desired.

DATA REDUCTION:
None. However, an Initial Flight Report (AFSC Form 5314) will be submitted to the IP within two days. Discuss overall performance, effects of thrust, drag, and airspeed

adjustment, and ability to control flare/touchdown points. Evaluate use of T-38A as a low L/D performance simulator aircraft.

REQUIRED PLOTS:

None

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HIGH L/D DEMO and GLIDER CHECKOUT

REFERENCES:

1. High L/D Course Handout, USAFTPS.

2. "The Joy of Soaring," Carle Conway.

3. FAR, Parts 61 and 91.

PURPOSE:

To familiarize the students with glider (high L/D performance) flying.

AIRCRAFT:

Schweizer 2-33, 1-26, and Blanik L-13.

LIMITATIONS:

1. FAR, Parts 61 and 91.

2. Contractor local operating procedures.

3. Minimum altitude for stall recovery is 1500 feet AGL.

GENERAL:

FTE/Ns may ride in the front seat. While there is no requirement for flying proficiency in any maneuver, FTE/Ns are encouraged to attempt maneuvers when no conflict with the lesson's desired learning objective is encountered.

PROCEDURES:

Detailed as follows:

Day 1

Pilot Glider Program (Does not include spin flights)

Flt No.	Type	Tow	Time	Remarks
1	SGS 2-33	3000	20	Takeoff, Box Wash, Airspeed Control, Stalls, Coordinated Turns, Sideslips, Spiral Turns, Pattern, Landing
2*	SGS 2-33	1000	10	Takeoff, Pattern, Landing
3**	SGS 2-33	200-500	5	Takeoff, Simulated Rope Break, Pattern, Landing
4	SGS 2-33	2500	20	Solo. Takeoff, Sideslips, Coordinated Turns, Pattern, Landing
5	SGS 1-26	3000	30	Solo. Takeoff, Coordinated Turns, Steep turns, Stalls, Sideslips, Pattern, Landing

* Optional
** Simulated Rope Break can be on 1, 2, or 3.

Engineer Glider Program (Does not include spin flights)

Flt No.	Type	Tow	Time	Remarks
1	SGS 2-33	3000	20	Demo
2	L-13	3000	20	Demo

1. The general soaring information (traffic patterns, glider operation, etc.) can be found in the USAFTPS High L/D Handout. The following are specific maneuvers that will be accomplished as indicated in the remarks column for each flight.

a. Box the Wash. From a high-tow position, signal for the box by descending through the wake for 5-10 seconds, then back to high tow. Move laterally to the right using only rudder until the towplane's tailwheel appears superimposed over its opposite main wheel. Pause momentarily, then move down (holding the lateral offset) to low tow, with the towplanes's elevator dividing its aft canopy. Hold position momentarily, then move left slowly across to the same position on the low left side of the towplane. Pause momentarily, then slowly climb to high tow while maintaining left lateral spacing. Complete the maneuver by slowly returning the centered high tow position. Be sure to make all moves slowly and with wings level.

b. Sideslips. Feed in rudder pedal to full deflection while using opposite aileron force to maintain ground track. Observe descent rate, airspeed, and approximate sideslip and bank angle.

c. Turns.

(1) Coordinated shallow and steep banked turns.

(2) Spiral. From a steep turn (45° bank) slowly increase bank and back pressure and allow the nose to fall well below the horizon. Recover by relaxing back pressure and shallowing bank to less than 45°, then gradually increase back pressure while rolling out of the turn. Do not over stress the sailplane!

d. Stalls. Straight ahead and 30° bank. Note stall airspeed for 1 kt/sec and 5 kt/sec bleed rates. Determine altitude loss.

INSTRUMENTATION:

None

DATA REDUCTION:

None

REQUIRED PLOTS:

None

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PROPULSION DEMO (PILOTS)

REFERENCES:

1. F-15 Flight Manual.

2. Performance Phase Textbook, Chapter 7, "Aero Propulsion."

3. "F-15E/PW-229 System Operability and Performance Qualification Test Program", TIS No. CP082FF019.

PURPOSE:

To demonstrate typical procedures and techniques used to flight test engines for high performance aircraft.

AIRCRAFT:

F-15B. The preferred external store configuration is wing pylons only with no centerline pylon or external wing tanks. However, centerline tank or clean configurations are acceptable.

GENERAL:

1. This mission is designed to provide future test pilots an exposure to recognized techniques and procedures used in flight testing turbojet and turbofan engines for high performance aircraft. This profile is designed to simulate a single engine aircraft due to the inherent increase in difficulty accomplishing the test points associated with such aircraft; the non-test throttle will be placed in idle (mil for supersonic points). The profile is extremely busy and fuel critical. This will also be the first ride in which data is collected while accomplishing an engine airstart. Specific techniques and the specific mission profile will be covered during the FTT briefing dedicated to this mission.

2. This ride includes a combination of the techniques presently used in the F-16 and F-15 Test Squadrons. As such, there is some compromise in teaching the exact techniques for each aircraft. However, it should be noted that each new aircraft will present new problems to the test team and, therefore, will possibly require innovation. Also, realize that a lot of the propulsion testing done today is to investigate compatibility of a new engine in an established airframe, to compare the performance of the new engine to previously installed engines, and to evaluate modified engine hardware or software.

3. There is no special instrumentation required for this mission, and all data will be recorded from cockpit instruments. Consequently, extensive preplanning and forethought will be required to be able to modulate thrust and drag, remain within the data band, and accurately read the engine instruments while performing the FTTs.

LIMITATIONS:

In addition to the F-15 Flight Manual limitations, the following limitations will be observed:

1. Only one engine at a time will be used for afterburner transients.

2. If any engine anomaly is observed in Region 1 during the profile, the mission will be terminated.

3. All throttle transients and airstarts will be accomplished with the same engine during the flight. This engine, denoted as the test engine in the ride description, will be determined by calendar day. If the mission is flown on an odd day, the number 1 (left) engine will be used; on an even day the number 2 (right) engine will be used. This will help ensure an even distribution of cycles between engines. Pilots will record the total number of engine starts on the AFTO Form 781.

4. Pilots will ensure that the cockpit pressurization remains within the flight manual pressurization schedule tolerance on all data points above 25,000 ft pressure altitude.

5. Both engines may be used between data points to assist in the expeditious transition through the profile.

6. Due to profile test points accomplished in an unloaded condition, crew members will ensure that the minimum required loose items are taken on the flight. All loose items taken will be stowed prior to takeoff.

7. During the airstart portion of the profile, front cockpit pilots will not shut down any engine, start the JFS (if necessary), or engage the JFS to the airframe mounted accessory drive (AMAD) without the approval of the IP.

8. Flight control inputs during maneuvering flight should be made at a rate that will provide adequate Overload Warning System (OWS) warning against over-g.

9. All throttle inputs during bodies and transients will be accomplished in less than 0.5 seconds.

MISSION EVENTS:

1. Briefing.

IP: The IP will brief the entire mission, with emphasis on types of throttle inputs, required data collection, test points of difficulty, and airstart limitations.

2. Engine Start.

Pilot: Ground engine start parameters are recorded in order to establish a baseline for comparison of ground and airstarts. Record light-off time for the test engine (time from throttle at idle to first Fan Turbine Inlet Temperature (FTIT) indication), time to 60% (from the throttle in the idle detent), and maximum FTIT.

3. Lineup Check Transient.

Pilot: Like the ground start, a ground throttle transient is performed to establish a baseline for in-flight transients. Request a one minute delay on the runway when checking in with tower. After runway lineup, note idle rpm and perform a throttle transient on the test engine only. Set the throttle to mil, stabilize for 15 seconds and note the rpm, then snap the throttle to the idle position until idle + 5%. At idle + 5%, snap the throttle to the mil position. Note minimum rpm and time from throttle at the mil position to stabilized mil thrust (as indicated by achieving mil thrust rpm). The other engine should remain at idle for the test point to allow the brakes to hold the aircraft.

4. Flight Manual Takeoff.

Pilot: Perform a military power flight manual takeoff.

5. Military Power Climb.

Pilot: Perform a military power climb to 10,000 ft pressure altitude.

6. Military Power Level Acceleration (0.4M to 0.8M, 10K).

Data Band: ±100 ft, ±1° AOB.

Pilot: Perform a two engine level acceleration in military power. The specified power setting should be maintained for 20-30 seconds prior to the run to ensure a thermally stable engine condition. Note time and fuel to accelerate from beginning to end of the test band. The purpose of this test is to compare the results of this engine to previously installed engines. Two engines are used on this test point to demonstrate the unique techniques for accomplishing the maneuver with high thrust output engines.

7. Maximum Power Climb (0.7 M, 25K to 38K).

Data Band: ±0.05M.

Pilot: Perform a two engine 0.7M afterburner climb from 25,000 ft pressure altitude to the altitude at which Segment 5 afterburner is locked out. This will occur at some altitude between 30,000 and 38,000 ft pressure altitude as indicated by a substantial reduction in thrust. If lock out does not occur before 38,000 ft, terminate the test point by rolling inverted and recovering to level flight. Refer to "Airspeed Limitation and Afterburner Operating Envelope" in Section 5 of the flight manual. Note that you are in Region 2 operations at this mach and altitude. Therefore, do not move the throttles except to deselect afterburner until airspeed increases above 250 KCAS. Maintain airspeed above 170 KCAS throughout the test to preclude Region 3 operation. Note the altitude of lock out.

8. Supersonic Throttle Transient (1.3M, 35K).

Data Band: ±0.05M, ±1,000 ft.

Pilot: Accelerate to the test point using both engines in as rapid a manner as possible. Bring the non-test engine to mil. Perform a mil-max-mil-max transient, as follows. Stabilize at mil on the test engine for 15 seconds prior to the first throttle movement. Maintain max for 5 seconds from throttle selection (not stabilized thrust), then mil throttle position for 5 seconds, then select max again. Stabilization is required for the initial mil power setting only. Subsequent throttle positions and times are not intended to allow stabilization. The aircraft will decelerate throughout the maneuver, so start high and fast in the band. Note any abnormal afterburner operations.

9. High Altitude Throttle Transient (300 KCAS, 50K).

Data Band: ±10 KCAS; +0, -1,000 ft.

Pilot: Using energy from the supersonic transient, zoom the aircraft to 50,000 ft pressure altitude. Use both engines in the climb. Establish at a speed that will allow sufficient lead to ensure engine stabilization prior to entry into the data band. Pull the non-test engine back to mil. Perform an idle-max-idle transient on the test engine, as follows. The engine should stabilize at idle for 15 seconds prior to the snap to max. Time for 10 seconds once the throttle is in the max position; the engine may not stabilize at max thrust. Snap the engine to idle again. Since you will be thrust deficient while conducting this test point, descend as necessary to maintain airspeed. Note any engine anomalies.

10. Non-Maneuvering Throttle Transients (0.8M, 30K), IP Demo, Student Practice.

Data Band: ±0.05M, ±1,000ft.

Pilot: When on conditions, place the non-test engine to idle and accomplish a series of transients. The order of points is driven by a build-up approach presenting the engine with increasing problems in handling pressure gradients and transitions from the accel/decel control schedules. Success for the test is defined as the absence of any engine anomalies. The following points should be accomplished in an expeditious manner, allowing for 15 seconds of stabilization time at the initial power setting:

a. Mil-Idle-Mil Transient. Snap the throttle from mil to idle. Allow the engine to stabilize at idle rpm. Note the idle rpm; it will be used for subsequent points. Snap the throttle to mil and note time from throttle at mil to mil thrust (as indicated by achieving mil thrust rpm).

b. Mil-Idle+5%-Max Transient. Record minimum rpm and time from throttle at the max position until power is stabilized at max thrust (as indicated by achieving stabilized nozzle opening).

c. Max-Idle Snap. Record time from throttle at idle detent to stabilized idle rpm.

During portions of these transients, thrust will exceed that required for 0.8M at 30,000 pressure altitude; on other portions, the aircraft will be thrust deficient with the non-test engine at idle. Therefore, speed brake, descents, or climbs should be used to stay within the data band.

11. Maneuvering Throttle Transients (0.8M, 25K), IP Demo, Student Practice.

Data Band: ±0.02M, ±2,000 ft.

Pilot: Perform the following maneuver transients with the non-test engine at idle.

a. Idle-Max Throttle Transient at 21 Units AOA. The TPS imposed tolerance for the AOA will be ±1 unit. Allow the test engine to stabilize at idle for 15 seconds prior to the snap. Since the non-test throttle will also be placed at idle, this positively loaded test point will be an energy consumer. Therefore, to accomplish the transient within the data band, it will be necessary to establish the aircraft slightly above test point Mach number and 3 to 4 thousand feet above the test altitude. Establish test Mach number and AOA prior to entering the top of the data band and select throttle to max as the aircraft passes through 27,000 ft. Record the time to light off and full afterburner and note any engine anomalies.

b. Idle-Max Throttle Transient During Sideslip. Place the test throttle at idle and allow the engine to stabilize for 15 seconds. Apply ½ rudder pedal on the same side as the test engine to establish a simulated imposed limit angle of sideslip. While maintaining the sideslip, snap to max and continue to hold sideslip until full

afterburner. Increasing rudder inputs will be required to maintain the sideslip as the thrust increases on the test engine. This test point evaluates the ability of the engine/inlet combination to accomplish an afterburner light with disturbed airflow resulting from the sideslip condition. Record the time to light off and full afterburner and note any engine anomalies.

c. Idle-Max Throttle Transient at Negative g. With power set at idle for a minimum of 15 seconds, roll the aircraft inverted and push to -1 g (10 sec limit). Snap the throttle from idle to max. Record times to light off and full afterburner and note any engine anomalies.

12. <u>Lubrication System Check (350 KCAS, 20K).</u>

Data Band: ±50 KCAS, ±5,000 ft, ±0.2 g.

Pilot: With the non-test engine at idle, place the test engine to mil and note the stabilized oil pressure. Then, roll the aircraft left to 120° angle of bank and unload to -1 g. This places the oil sump on the F100-PW-100 directly above the engine. Hold for 10 seconds. Roll back upright and allow the oil to slug back into the system (4-5 seconds). Note the oil pressure. These test points allow for observation of possible oil pressure spikes to the engine following maneuvering flight.

13. <u>Low Speed Transient (130 KCAS, 15K). (Optional).</u>

Data Band: ±10 KCAS, ±1,000 ft.

Pilot: Perform a idle-max throttle snap. Slow the aircraft to achieve the desired test conditions at 1 g. Allow the engine to stabilize at idle for 15 seconds prior to accomplishing the snap. Note the times to light off and stabilized max thrust (as indicated by full open nozzle).

14. <u>Airstarts (300 KCAS, 25K, 40% and 25% rpm).</u>

Data Band: +1000, -500 ft, ±5 KCAS, ±2% rpm (TPS imposed limit).

Pilot: Two spooldown restarts will be performed on the test engine with the non-test engine placed at idle. On single engine aircraft, engine shutdowns and airstarts would be performed near high key for one of the lakebed runways in case of an unsuccessful airstart. A significant amount of preplanning must be accomplished to allow for entry into the simulated flameout (SFO) pattern. The demo should be performed within gliding range to the lakebed runways. Ensure the following pre-shutdown checks are accomplished prior to each airstart run:

a. Oxygen - 100%
b. Air Source - BOTH
c. Non-test engine - IDLE
d. JFS switch - ON
e. Radar - STBY
f. Test engine generator - OFF

The normal build-up approach to airstarts would begin with JFS assisted starts, followed by spooldown starts of decreasing rpm, and finished with windmilling restarts. At TPS, due to time and configuration limitations (the JFS in-flight start window is small with respect to altitude when a centerline tank and/or pylon are installed), only the spooldown starts will be done. Prior to each start, the test engine will be placed to mil power for a minimum of 1 minute to obtain an engine core temperature as close to that of a stagnation condition as possible. The engine should be shutdown above the test altitude so as to reach the desired airstart rpm, with airspeed within tolerance, as the aircraft enters the top of the data band. Therefore, sufficient lead will be necessary. When the rpm reaches the target, place the throttle to mid-range. Note the time to light off from throttle placed to mid-range, time to 60% rpm, and maximum FTIT. Monitor engine FTIT on start to ensure it remains below 800°C. Following the start, cycle the test engine EEC at 80% rpm and check the engine responds normally through mil. Following the completion of airstarts, turn generator and radar back on.

15. Recovery/Landing.

Pilot: Following the last airstart, accomplish the Overhead Precautionary Approach (OPA) as depicted in Figure 5. Maximum fuel load to accomplish the approach will be no greater than full internal fuel (approximately 11,500 lbs on an F-15B). The OPA will be taken to a low approach (so as not to touch down). The purpose of the Overhead Precautionary Approach is to provide a recovery method that allows for maintenance of energy state in the event of engine related emergencies. This pattern does not simulate a flameout approach, differing in the sense that it is intended to be flown with at least one engine operating. Power is applied (as required) once established on final approach. This type of approach in testing in not uncommon for two engine aircraft. In fact, OPAs were developed for the F-15, STOL F-15, and Advanced Tactical Fighter test programs. Following the OPA, make a normal pattern and landing.

OVERHEAD PRECAUTIONARY APPROACH

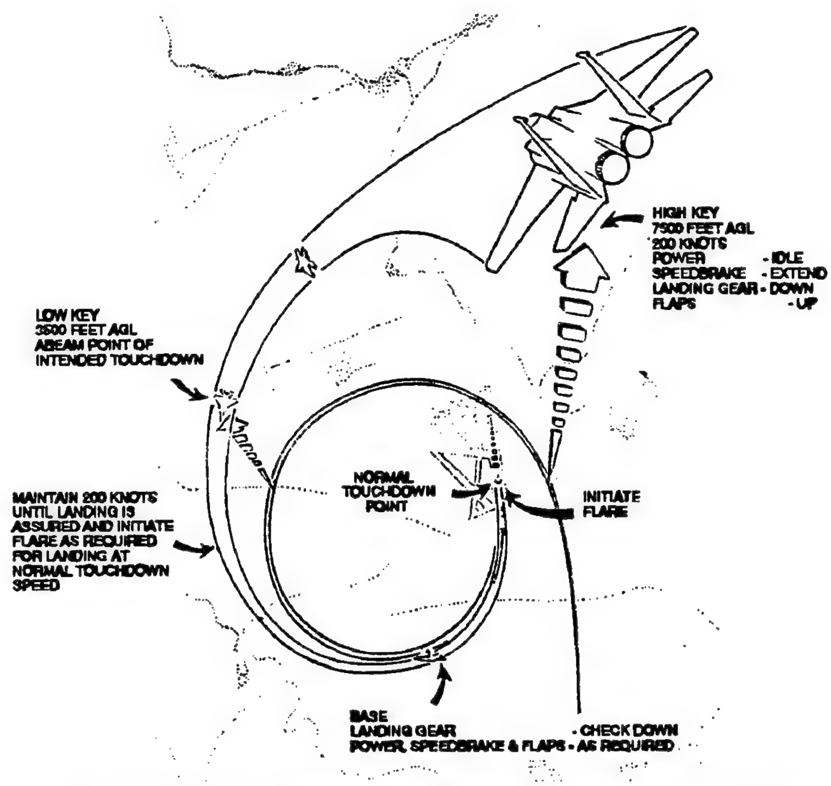

FIGURE 5 OVERHEAD PRECAUTIONARY APPROACH

INSTRUMENTATION:

None.

REPORT:

None.

C-141 PERFORMANCE DEMO

REFERENCE:

1. T.O. 1C-141A-1, C-141A Flight Manual.

2. T.O. 1C-141A-1-1, C-141A Performance Manual.

PURPOSE:

1. To familiarize the students with performance flight testing of large aircraft.

2. The student will be familiar with:

   a. Performance flight test techniques.

   b. Crew coordination.

   c. In-flight data taking techniques; hand recorded from cockpit instruments and integrated telemetry analysis system (ITAS), if present.

   d. C-141A Performance Manual climb and descent charts.

AIRCRAFT:

C-141 (80,000 lb fuel load).

LIMITATIONS:

None.

GENERAL:

Two student pilots and two student FTE/Ns will be scheduled with one IP for one 4.0 hour sortie. One student pilot will occupy the left seat while the instructor pilot occupies the right seat. The student pilot and FTE/N will comprise the test team and will direct the mission with guidance from the instructor pilot. The students will make in-flight seat changes so that each student pilot will complete all the events and the student FTE/N will complete Events 5-10.

MISSION EVENTS:

1. <u>Mission Preparation.</u>

   Students: Compute NRT climb fuel and time for the initial climb to 20,000 ft. Compute the descent time for the penetration descents from 15,000 to 5,000 ft. Each student pilot will prepare his own flight cards; the FTE/N will prepare his data cards. Data will be taken on the initial takeoff, NRT climbs, MRT level accelerations, stabilized aerodynamic modeling test points, and the penetration descents.

2. Briefing.

Instructor Pilot: Brief the entire mission and be responsible for all normal and emergency procedures.

3. Pre-flight/Start/Taxi.

a. Instructor Pilot: Responsible for aircraft preparation and ground operations.

b. Pilot: Start the engines and taxi the aircraft. Assist the IP during other preflight activities as directed.

4. Ground Block.

FTE/N: Direct a performance ground block and record appropriate data.

5. Normal Takeoff (TO).

a. Instructor Pilot: Monitor correct takeoff procedures.

b. Flight Engineer: Provide takeoff and weight and balance data.

c. Pilot: Perform the takeoff and call out the takeoff speed.

d. FTE/N: Call takeoff distance and record takeoff data.

6. NRT Check Climb (CR).

a. Pilot: Perform a NRT check climb from 5,000 to 20,000 ft. The flight engineer will provide climb EPR and fuel weight.

b. Flight Engineer: Record initial and final fuel weights.

c. FTE/N: Record time, airspeed, total temperature, and fuel weight at the beginning and every 2000 ft of the climb.

7. Back Side Trim Shot (CR).

Pilot: Perform a trim shot at 20,000 ft and 150 KCAS.

8. MRT Level Acceleration (CR).

a. Pilot: Perform an MRT level acceleration from 180 to 330 KCAS at 20,000 ft. Coordinate with other crewmembers to obtain time and altitude every 10 knots.

b. Flight Engineer: Calculate initial and final fuel weights.

c. FTE/N: Record time, altitude, and climb rate at each 10 knot increase in airspeed. Also record initial and final fuel weight and total temperature. Make an in-flight plot of time to accelerate through each 10 knots as a function of airspeed. Use altitude variations to assist in drawing the curve.

9. Spoiler Operation.

Pilot: Extend the spoiler to aid in decelerating to 0.55 Mach number in preparation of upcoming aerodynamic modeling test points.

10. Aerodynamic Modeling (CR).

a. Constant Altitude.

(1) Pilot: Stabilize the aircraft for 10 seconds at 20,000 ft PA and 0.55 Mach number at bank angles of 0°, 30°, and 45°.

(2) Flight Engineer: Compute fuel weight for each test point.

(3) FTE/Ns: Record altitude, airspeed, vertical load factor, bank angle, pitch angle, total temperature, engine pressure ratios, and fuel weight.

b. Roller Coaster.

(1) Pilot: Perform the roller coaster dynamic aerodynamic modeling flight test technique at 20,000 ft PA and 0.55 Mach number (0.2-1.8 g). Remember to stabilize for 10 seconds at the target altitude and Mach number before performing the maneuver.

(2) Flight Engineer: Compute fuel weight.

(3) FTE/N: Monitor maneuver for smooth variations in load factor. Note how differences in g onset rates effect the ability of the pilot to maintain the aircraft within test point Mach number and altitude tolerances.

11. Three-Engine Sawtooth Climb (Power Approach).

a. Pilot: Perform a wings level, constant heading sawtooth climb at 230 kt and 18,000 ft PA with one outboard engine at idle and the remaining engines at MRT.

b. Flight Engineer: Compute initial and final fuel weights.

c. FTE/N: Record initial and final time, altitude, airspeed, climb rate, and fuel.

12. Penetration Descent (CR).

a. Pilot: Perform a penetration descent from 15,000 to 5,000 ft, two engines at idle, two engines at 2000 pph fuel flow, maintaining 250 KCAS.

b. Flight Engineer: Compute initial and final fuel weights.

c. FTE/N: Record time, airspeed, total temperature, and fuel weight at the beginning and every 2000 ft of the descent.

13. Tower Flyby (CR).

a. Pilot: Perform a 200 KIAS tower flyby in the cruise configuration. The radar altimeter is available to remain above ground effect. A very shallow intercept angle to final is required to prevent overshooting the tower flyby line.

b. FTE/N: Record airspeed, altitude, and total temperature.

14. Touch-and-Go/Full Stop Landing.

Instructor Pilot: Demonstrate a touch-and-go landing.

Pilot: Perform touch-and-go landings and the full stop landing.

15. Ground Block.

FTE/N: Conduct a performance end of mission ground block and record appropriate data.

16. Debriefing.

a. Pilot: Make qualitative comments regarding C-141 performance. Coordinate with the FTE/N on a review of in-flight data.

b. FTE/N: Present in-flight data and show comparisons with performance manual predictions. Complete AFSC Form 5314 to cover data items; initial takeoff, NRT climb, MRT level acceleration and penetration descent. Turn AFSC Form 5314 in to staff FTE/N the next day.

c. Instructor Pilot: Critique techniques, data quality and crew coordination.

INSTRUMENTATION:

1. Stopwatch.

2. ITAS (if available).

DATA REDUCTION:

1. Compare time and fuel for the initial NRT climb with performance manual estimates.

2. Compare time for penetration descents with performance manual estimates.

REQUIRED PLOTS:

In-flight plot of time to accelerate as a function of airspeed for the level accelerations.

FLIGHT TEST TECHNIQUE (FTT) PRACTICE AND DEMONSTRATION SORTIES

PURPOSE:
To provide guidance for FTT student practice and demonstration sorties.

AIRCRAFT:
This guidance can be applied to FTT sorties conducted in all of the syllabus aircraft.

LIMITATIONS:
Review all flight manual, test plan, interim safety and operational limitations, as well as those addressed in this Phase Planning Guide for the applicable aircraft.

GENERAL:
These instructions are not to be considered all inclusive, but should be used as a guide for developing a mission profile that adequately demonstrates the performance of the applicable aircraft and/or allows sufficient practice of the desired FTT. No FTT will be performed that has not previously been discussed in the classroom, briefed and/or demonstrated. These FTT profiles are also presented in the applicable aircraft aircrew aids. A thorough review of the textbooks and this planning guide should be accomplished to ensure proper execution of each FTT. Tolerances for the FTTs are as discussed in this planning guide and listed in Section V.

MISSION EVENTS:

1. Mission Preparation and Briefing.

a. Students will thoroughly brief the mission, assuring that all applicable items of both the general and specific mission briefing guides are covered.

b. Students will prepare data cards for the flight. The following minimum information is required on the cards:

(1) Names, call sign, ops number, and aircraft type.

(2) Mission events, to include altitude and airspeed bands for each maneuver.

(3) Pertinent limits for each maneuver, when applicable.

c. Data cards will be reviewed and initialed by a TPS staff IP qualified in the aircraft.

d. Data procedures and calls should be practiced as a test aircrew team.

e. Where appropriate, the accompanying IP will brief specific and general mission events that he/she will accomplish or aid the student crew in accomplishing.

2. Ground Block.

A performance ground block should be accomplished prior to each flight.

3. Takeoff.

Perform a normal flight manual takeoff. Takeoff data should be taken on each sortie.

4. In-flight.

Accomplish the appropriate FTTs depicted in the following tables.

FTT	AIRCRAFT	POWER	DATA BAND	REMARKS
CHECK CLIMB	T-38, F-16/15	Mil	5K-20K	TPS climb schedule in aircrew aid or flight manual climb.
		Max	5K-25K	
	A-37	Max	5K-20K	Flight manual climb schedule.
	C-23	MRP/1400 prop rpm	1500 AGL-8K	
	KC-135	NRT	5K-20K	280 KIAS ATC compliant climb.
	C-141	NRT	5K-20K	Monitor and reset EPR as required. 250 KCAS to 10K, then 280 to 0.7 Mach.
TRIM POINT	T-38, F-16/15	As Required	300 Kts, 30K	Front side.
			230 Kts, 30K	Back side.
	A-37	As Required	200 Kts, 20K	Front side.
			120 Kts, 20K	Back side.
	C-23	As Required	120 Kts, 8K	Front side.
			95 Kts, 8K	Back side.
	KC-135	As Required	330 Kts, 20K	Front side.
			.6 AOA, 20K	Back side.
	C-141	As Required	300 Kts, 20K	Front side.
			200 Kts, 20K	Back side.

FTT	AIRCRAFT	POWER SETTING	DATA BAND	REMARKS
LEVEL ACCEL (1G)	T-38	Mil	250 Kts-0.9M, 30K	
		Max	0.85M-1.1M, 30K	
	F-16/15	Mil	250 Kts-0.9M, 30K	
		Max	0.85M-1.2M, 30K	
	A-37	Max	130 Kts-V_{max}, 10K	
	C-23	MRP/1400 prop rpm	95 Kts-V_{max}, 8K	
	KC-135	MRT	200-350 Kts, 20K	Set MRT for accel from the 0.6 AOA trim point.
	C-141	MRT	200-300 Kts, 20K	Set MRT for accel at approx 180 KCAS.
LOADED LEVEL DECEL (4G)	T-38	Max	1.1M-.9M, 30K, 4G	Terminate prior to low speed indications (moderate buffet).
	F-16/15	Mil	1.2M-.9M, 30K, 4G	Be vigilant for Mach tuck when decelerating through transonic region. Terminate no slower than approach AOA.
LEVEL DECEL (1G)	T-38	Idle	.9M-250 Kts, 30K	
	F-16/15	Idle	.9M-250 Kts, 30K	
	A-37	Idle	V_{max}-130 Kts, 10K	
	KC-135	Idle	350-250 Kts, 20K	Investigate effects of speed brakes and spoilers.
	C-141	Idle	300-200 Kts, 20K	

FTT	AIRCRAFT	POWER SETTING	DATA BAND	REMARKS
SAWTOOTH CLIMBS	C-23	MRP/1400 prop rpm	7-8K	Approach configuration. Use three airspeeds to approximate the bucket (final approach airspeed, +10 KIAS, +20 KIAS).
	KC-135	MRT	8-12K	Approach configuration. Use three airspeeds to approximate the bucket.
	C-141	MRT	8-12K	Approach configuration. Use three airspeeds to approximate the bucket.
LOADED LEVEL ACCEL	T-38	Mil	300 Kts-.9M, 20K, 2G	
	F-16/15	Mil	300 Kts-.9M, 20K, 2G	
	A-37	Max	V_{min}-V_{max}, 10K, 2G	
	C-23	MRP/1400 prop rpm	110 Kts-P_s = 0, 8K, 1.4G	
	KC-135	MRT	1.1 V_{STALL} for 1.4G to V_{max}, 10K, 1.4G	Compute V_{STALL} for 1.4g prior to maneuver.
	C-141	MRT	1.1 V_{STALL} for 1.4G to V_{max} 10K, 1.4G	

FTT	AIRCRAFT	POWER SETTING	DATA BAND	REMARKS
LOADED LEVEL DECEL	T-38	Mil	0.9M-P_s = 0, 20K, 3g	After noting P_s = 0 stable point airspeed retard throttles to idle and decelerate at 3g to moderate buffet.
	F-16/15	Mil	0.9M-P_s = 0, 20K, 3g	After noting P_s = 0 stable point airspeed retard throttles to idle and decelerate at 3g.
	A-37	Max	V_{max}-P_s = 0, 10K, 3g	
	C-23	Idle	P_s = 0-110 Kts, 8K, 1.4g	
	KC-135	Idle	V_{max} to 1.1V_{STALL} for 1.4g, 10K, 1.4g	Initiate maneuver after attaining conditions from loaded accel.
	C-141	Idle	V_{max} to 1.1V_{STALL} for 1.4g, 10K, 1.4g	
TURN PERFORMANCE	T-38	Mil	300 Kts, 30K	
		Max	350 Kts, 25K	6 g maximum.
	F-16/15	Mil	300 Kts, 30K	
		Max	350 Kts, 25K	6 g maximum.
	A-37	Max	280 Kts, 10K	5 g maximum.
	C-23	1400 prop rpm, Torque for 130 KIAS trim point +250 lb ft	8K	Use the timed turn method to obtain one front side (1.4g) and one back side (120 KIAS) data point
	KC-135	NRT	10K	Use the timed turn method to obtain one front side (300 Kts) and one backside (200 Kts) data point.

FTT	AIRCRAFT	POWER SETTING	DATA BAND	REMARKS
CHECK DESCENT	T-38	Idle	30K-25K, 240 Kts	Max range descent.
		Idle	30K-10K, .84M	High speed descent, SB out.
		80% rpm	20K-10K, 300 Kts	Penetration descent, SB out.
	F-16/15	Idle	30K-25K, 250 Kts	Max range descent.
		Idle	30K-10K, .8M	High speed descent, SB out.
		70% rpm (F-16); 72% rpm (F-15)	20K-10K, 300 Kts	Penetration descent, SB out.
	A-37	Idle	10K-5K, 140 Kts	Max range descent.
		70% rpm	20K-10K, 230 Kts	Penetration descent, SB out.
	C-23	Idle, 1200 prop rpm	8K-5K, 150 Kts	Maintain 400 ft/min rate of descent.
	KC-135	2 engines at Idle, 2 engines at 80%	15K-5K	Penetration descent. Maintain 280 Kts to 10K then 250 Kts.
		Idle	25K-15K, V_{max}	Emergency descent, spoilers and speed brakes as required/desired.
	C-141	2 engines at Idle, 2 engines at 2000 pph	20K-5K	Enroute descent. Use 0.74M to 300 Kts, 300 Kts to 10K, then 250 Kts.
		Idle	30K-20K	Modified emerg descent. Use 0.70M to 300 KIAS. Extend spoilers at 300 KIAS.
		Idle	20K-10K, 250 Kts	Penetration descent. Use spoilers as required to maintain 4000-6000 ft/min rate of descent.

FTT	AIRCRAFT	POWER SETTING	DATA BAND	REMARKS
TOWER FLYBY	T-38	As Required	300 Kts	Cruise configuration.
			180 Kts	Power approach configuration.
	F-16/15	As Required	300 Kts	Cruise configuration.
			180 Kts	Power approach configuration.
	A-37	As Required	250 Kts	Cruise configuration.
			130 Kts	Power approach configuration.
	C-23	As Required	130 Kts	Cruise configuration.
	KC-135	As Required	250 Kts	Cruise configuration. Remain out of ground effect.
			Final approach airspeed +20 Kts	Power approach configuration. Remain out of ground effect.
	C-141	As Required	200 Kts	Cruise configuration. Remain out of ground effect.
			Final approach airspeed +20 Kts	Power approach configuration. Remain out of ground effect.

5. Patterns and Landing.

Accomplish touch and go landings (if approved) and a full stop spot landing using the flight manual procedures. If an IP is on board, various emergency patterns (i.e., no flap, simulated engine out, etc.) may be accomplished using the appropriate procedures. Simulated flameout (SFO) approaches may be practiced with the A-37 and F-16.

6. Debriefing.

Students will debrief after each mission. Items to be discussed will include effectiveness of the FTT used and the quality of the data obtained.

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SECTION V
PERFORMANCE PHASE MANEUVER TOLERANCES AND STANDARD WEIGHTS

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PERFORMANCE FTT DATA BANDS AND TOLERANCES

MANEUVER	DATA BAND	TOLERANCE
CHECK CLIMB	-	± 2 KIAS (mil), ± 5 KIAS (max)
TRIM SHOT	± 2 KIAS, ± 100 ft	± 2 KIAS, ± 100 ft/min, stable for 10 sec
LEVEL ACCEL/DECEL	± 500 ft	±100 ft, ± 100 ft/min, N/A transonic
LOADED LEVEL ACCEL/DECEL	± 500 ft	± 100 ft, ± 200 ft/min, ± 0.2 g
TURNS	± 4 KIAS, ± 500 ft	± 2 KIAS, ± 100 ft, ± 100 ft/min, ± 0.2 g
SAWTOOTH CLIMB	± 3 KIAS	± 1 KIAS
AERO MODELING:	± 0.01 MACH	-
CONSTANT ALTITUDE	± 500 ft	VVI = 0, stable for 10 sec
DESCENDING TURN	± 1000 ft	stable for 10 sec
DYNAMIC	± 1000 ft	-
SPEED POWER	± 2% W/δ (Fighter), ± 0.5% W/δ (Heavy), ± 3 KIAS	± 2 KIAS, ± 100 ft, ± 100 ft/min, stable for 3 min
CHECK DESCENT	-	± 2 KIAS, or ± 0.02 Mach

PERFORMANCE FTT DATA BANDS AND TOLERANCES (CONTINUED)

MANEUVER	DATA BAND	TOLERANCE
AIR DATA SYSTEM CALIBRATION:	-	-
TOWER FLYBY	± 5 KIAS	Stable (VVI = 0, airspeed constant)
PACE	± 5 KIAS, ± 500 ft	Stable (VVI = 0, airspeed constant)
RADAR	± 5 KIAS (Pressure survey aircraft), ± 100 ft, ± 500 ft transonic	± 100 ft/min, N/A transonic
SPEED COURSE	± 5 KIAS	± 1 KIAS, ± 100 ft
SPOT LANDING	On speed ± 3 KIAS	T-38/F-15: ± 300 ft, F-16/C-141: ± 500 ft

Note: The data bands and tolerances listed above are generally suitable for the aircraft, instrumentation, and data analysis methods used at the USAF Test Pilot School. Some Flight Test Techniques (FTT) described in this guide include different data bands and tolerances more suitable to the specific FTTs. Other test items and methods may require different data bands and tolerances.

STANDARD WEIGHTS-PERFORMANCE DATA* (JP-8 FUEL)

	T-38A CLEAN (MILITARY POWER)	T-38A CLEAN (MAXIMUM POWER)	F-16B CENTERLINE FUEL TANK (MILITARY POWER)	F-16B CENTERLINE FUEL TANK (MAXIMUM POWER)	A-37B TIP TANKS (MILITARY POWER)	C-23A (MRCP CLIMB)	C-141A (NRT CLIMB)
Starting Gross Weight	12,697	12,697	26,317	26,317	10,000	20,800	235,00
Ground time (15 Minutes)	270	270	350	350	200	100	2,000
Takeoff Standard Weight	12,427	12,427	25,967	25,967	9,800	20,700	233,000
Fuel Used to Takeoff and Accelerate to Climb Speed	285	315	240	720	100	50	1,000
Standard Weight At Leveloff: (Check/Sawtooth Climb)							
Sea Level	12,142	12,112	25,727	25,247	9,700	20,650	232,000
5000	12,082	12,032	25,647	25,097	9,600	20,600	231,000
10,000	12,022	11,962	25,557	24,977	9,505	20,500	230,000
15,000	11,962	11,897	25,467	24,867	9,410	20,350	228,500
20,000	11,902	11,832	25,377	24,767	9,310	20,150	226,500
25,000	11,842	11,767	25,287	24,667	9,190	N/A	224,000
30,000	11,772	11,702	25,197	24,567	N/A	N/A	221,000
35,000	11,682	11,632	25,107	24,467	N/A	N/A	217,000
40,000	11,562	11,542	24,997	24,367	N/A	N/A	N/A
45,000	N/A	11,402	N/A	24,237	N/A	N/A	N/A

*All weights are in pounds.

**T-38A/F-16 Maximum Power Takeoff: Mil/MRP/NRT acceleration to climb speed.

	T-38A	F-16B	A-37B	C-23A	C-141A
Operating Weight	8,710	18,225	6,500	16,500	150,000
MIL-C-5011B Fuel Minimums (AFFTCR 55-2)	600	1,000	7000	600	12,000
One-half Fuel Weight (Turns)	10,704	22,271	8,250	18,650	192,500

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APPENDIX A
GRADESHEETS

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USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADE SHEET

STUDENT	INSTRUCTOR	MISSION T-38A DATA AIRCRAFT FAM (FTE/N)	CLASS	DATE
		AIRCRAFT TYPE/NO. T-38A/	FLIGHT TIME	GRADE

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. PREFLIGHT
4. NORMAL TAKEOFF, IP DEMO
5. MILITARY POWER CLIMB (5-25K, 350 KIAS)
6. A. TRIM SHOT, IP DEMO (30K, 300 KIAS)
   B. TRIM SHOT, STUDENT PRACTICE (25K, 280 KIAS)
7. BASIC FLIGHT ORIENTATION, IP DEMO AND STUDENT PRACTICE
8. LOCAL AREA ORIENTATION
9. STALLS AND RECOVERIES, IP DEMO
10. TURN PERFORMANCE, IP DEMO (15K, OPTIONAL)
11. SINGLE ENGINE FLIGHT AND AIRSTART, IP DEMO (OPTIONAL)
12. ACROBATICS, IP DEMO AND STUDENT PRACTICE (OPTIONAL)
13. MAXIMUM POWER CLIMB, IP DEMO (10-30K)
14. SUPERSONIC FLIGHT, STUDENT PRACTICE
15. PENETRATION DESCENT (10K BAND)
16. TOWER FLYBY, IP DEMO (350 KIAS)
17. N/A FOR T-38
18. A. TOUCH AND GO LANDINGS, IP DEMO
    B. LAKEBED LANDING, IP DEMO (OPTIONAL)
19. POSTFLIGHT
20. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT FAMT3894.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADE SHEET

STUDENT	INSTRUCTOR

MISSION	CLASS	DATE
F-16B DATA AIRCRAFT FAM (FTE/N)		

AIRCRAFT TYPE/NO.	FLIGHT TIME	GRADE
F-16B/		

MISSION EVENTS
1. MISSION PREPARATION
2. BRIEFING
3. PREFLIGHT
4. NORMAL TAKEOFF, IP DEMO
5. MILITARY POWER CLIMB (5-25K, 350 KIAS)
6. A. TRIM SHOT, IP DEMO (30K, 300 KIAS)
B. TRIM SHOT, STUDENT PRACTICE (25K, 280 KIAS)
7. BASIC FLIGHT ORIENTATION, IP DEMO AND STUDENT PRACTICE
8. LOCAL AREA ORIENTATION
9. STALLS AND RECOVERIES, IP DEMO
10. TURN PERFORMANCE, IP DEMO (15K, OPTIONAL)
11. N/A FOR F-16
12. ACROBATICS, IP DEMO AND STUDENT PRACTICE (OPTIONAL)
13. MAXIMUM POWER CLIMB, IP DEMO (10-30K)
14. SUPERSONIC FLIGHT, STUDENT PRACTICE
15. PENETRATION DESCENT (10K BAND)
16. TOWER FLYBY, IP DEMO (350 KIAS)
17. SIMULATED FLAMEOUT LANDING, IP DEMO
18. A. TOUCH AND GO LANDINGS, IP DEMO
B. LAKEBED LANDING, IP DEMO (OPTIONAL)
19. POSTFLIGHT
20. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT FAMF1694.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADE SHEET

MISSION C-141A DATA AIRCRAFT FAM (FTE/N)	CLASS	DATE	
AIRCRAFT TYPE/NO. C-141A/	FLIGHT TIME	GRADE	

STUDENT	INSTRUCTOR

MISSION EVENTS
1. MISSION PREPARATION
2. BRIEFING
3. PREFLIGHT
4. FTE STATION
A. INSTRUMENTATION AND SYSTEM KNOWLEDGE
B. SYSTEM PREFLIGHT AND POWER-ON
C. INFLIGHT NORMAL PROCEDURES
1) ITAS
2) VIDEO MONITOR
3) STRIPCHART
4) TEAC TAPE RECORDER
5) WEATHER RADAR
6) OXYGEN
7) INTERCOM SYSTEM
8) FLIGHT INSTRUMENTS
D. INSTRUMENTATION SYSTEM POST FLIGHT PROCEDURES
1) POWER DOWN PROCEDURES
2) STRIPCHART DATA REMOVAL
3) TEAC RECORDER DATA REMOVAL
5. JUMP SEAT
A. INTERCOM SYSTEM
B. OXYGEN SYSTEM
C. FLIGHT INSTRUMENTS
D. CLEARING
E. DEMONSTRATION OF FLIGHT MANEUVERS
F. LOCAL AREA ORIENTATION
6. PILOT SEAT
A. BASIC FLIGHT ORIENTATION
B. LOW APPROACH
7. SITUATIONAL AWARENESS
8. EMERGENCY PROCEDURES
9. JUDGEMENT
10. POSTFLIGHT
11. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT FAMC1494.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADE SHEET

STUDENT	INSTRUCTOR	MISSION C-23A DATA AIRCRAFT FAM (FTE/N)	CLASS	DATE
		AIRCRAFT TYPE/NO. C-23A/	FLIGHT TIME	GRADE

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. PREFLIGHT
4. NORMAL TAKEOFF, IP DEMO
5. MAXIMUM RECOMMENDED POWER CLIMB (5-10K, 130 KIAS)
6. A. TRIM SHOT, IP DEMO (10K, 140 KIAS)
   B. TRIM SHOT, STUDENT PRACTICE (8K, 130 KIAS)
7. BASIC FLIGHT ORIENTATION, IP DEMO AND STUDENT PRACTICE
8. LOCAL AREA ORIENTATION
9. STALLS AND RECOVERIES, IP DEMO
10. TURN PERFORMANCE, IP DEMO (8K, OPTIONAL)
11. SINGLE ENGINE FLIGHT AND AIRSTART, IP DEMO (OPTIONAL)
12. N/A FOR C-23
13. N/A FOR C-23
14. N/A FOR C-23
15. PENETRATION DESCENT (5K BAND)
16. TOWER FLYBY, IP DEMO (150 KIAS)
17. N/A FOR C-23
18. A. TOUCH AND GO LANDINGS, IP DEMO
    B. LAKEBED LANDING, IP DEMO (OPTIONAL)
19. POSTFLIGHT
20. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT FAMC2394.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADE SHEET

STUDENT	INSTRUCTOR	MISSION F-15B DATA AIRCRAFT FAM (FTE/N)	CLASS	DATE
		AIRCRAFT TYPE/NO. F-15B/	FLIGHT TIME	GRADE

MISSION EVENTS
1. MISSION PREPARATION
2. BRIEFING
3. PREFLIGHT
4. NORMAL TAKEOFF, IP DEMO
5. MILITARY POWER CLIMB (5-25K, 350 KIAS)
6. A. TRIM SHOT, IP DEMO (30K, 300 KIAS)
B. TRIM SHOT, STUDENT PRACTICE (25K, 280 KIAS)
7. BASIC FLIGHT ORIENTATION, IP DEMO AND STUDENT PRACTICE
8. LOCAL AREA ORIENTATION
9. STALLS AND RECOVERIES, IP DEMO
10. TURN PERFORMANCE, IP DEMO (15K, OPTIONAL)
11. SINGLE ENGINE FLIGHT AND AIRSTART, IP DEMO (OPTIONAL)
12. ACROBATICS, IP DEMO AND STUDENT PRACTICE (OPTIONAL)
13. MAXIMUM POWER CLIMB, IP DEMO (10-30K)
14. SUPERSONIC FLIGHT, STUDENT PRACTICE
15. PENETRATION DESCENT (10K BAND)
16. TOWER FLYBY, IP DEMO (350 KIAS)
17. N/A FOR F-15
18. A. TOUCH AND GO LANDINGS, IP DEMO
B. LAKEBED LANDING, IP DEMO (OPTIONAL)
19. POSTFLIGHT
20. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT FAMF1594.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

STUDENT	INSTRUCTOR	MISSION TOWER FLYBY DEMO/DATA (PILOT)	CLASS	DATE
		AIRCRAFT TYPE/NO. T-38A/	FLIGHT TIME	GRADE

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. FLIGHT MANUAL TAKEOFF AND DATA COLLECTION
5. TOWER FLYBY, IP DEMO (300 KIAS, CR CONFIGURATION)
6. TOWER FLYBYS, STUDENT DATA (FINAL APPROACH A/S TO MIL V_{max}, CR CONFIGURATION)
7. SPOT LANDING (ON SPEED ±3 KIAS, ±300 FT)
8. GROUND BLOCK (PERFORMANCE)
9. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

CLEARED SOLO: YES NO

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT TFBT3894.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
TOWER FLYBY DEMO/DATA (PILOT)		

STUDENT	INSTRUCTOR	AIRCRAFT TYPE/NO.	FLIGHT TIME	GRADE
		F-16B/		

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. FLIGHT MANUAL TAKEOFF AND DATA COLLECTION
5. TOWER FLYBY, IP DEMO (300 KIAS, CR CONFIGURATION)
6. TOWER FLYBYS, STUDENT DATA (FINAL APPROACH A/S TO MIL V_{max}, CR CONFIGURATION)
7. SPOT LANDING (ON SPEED ±3 KIAS, ±500 FT)
8. GROUND BLOCK (PERFORMANCE)
9. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

CLEARED SOLO: YES NO

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT TFBF1694.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
TOWER FLYBY DEMO/DATA (PILOT)		

STUDENT	INSTRUCTOR	AIRCRAFT TYPE/NO. C-141A/	FLIGHT TIME	GRADE

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. FLIGHT MANUAL TAKEOFF AND DATA COLLECTION
5. TOWER FLYBY, IP DEMO (CR CONFIGURATION)
6. TOWER FLYBYS, STUDENT DATA (FINAL APPROACH A/S TO 200 KIAS, CR CONFIGURATION)
7. SPOT LANDING (±3 KIAS, ±500 FT)
8. GROUND BLOCK (PERFORMANCE)
9. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

CLEARED SOLO: YES NO

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT TFBC1494.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

STUDENT	INSTRUCTOR	MISSION: MISSION DIRECTOR ORIENTATION (FTE/N)	CLASS	DATE
		AIRCRAFT TYPE/NO.: C-23A/	FLIGHT TIME	GRADE

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. TAKEOFF, IP DEMO AND IFTE/N MISSION DIRECTOR DEMO
5. CHECK CLIMB, IP DEMO AND IFTE/N MISSION DIRECTOR DEMO (4-8K, 130 KIAS, MRP/1400 PRPM)
6. TRIM SHOT, IP DEMO AND FTE/N MISSION DIRECTOR PRACTICE (9K)
7. LEVEL ACCEL, IP DEMO AND IFTE/N MISSION DIRECTOR DEMO (10K, $1.1V_s$ to V_{max})
8. 4° FLAP LEVEL ACCEL, STUDENT PRACTICE (9K, $1.1V_s$ to V_{max})
9. CHECK DESCENT, STUDENT PRACTICE, (MAXIMUM RATE DESCENT - 8-4K, 175KIAS, FLIGHT IDLE, 1675 PRPM)
10. ILS APPROACH, IP DEMO
11. TOUCH AND GO LANDINGS, IP DEMO (SHORT FIELD)
12. GROUND BLOCK (PERFORMANCE)
13. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT MSNDIR94.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
LEVEL ACCEL/TURN PERF DEMO (FTE/N) - MSN DIRECTOR		

STUDENT	INSTRUCTOR	AIRCRAFT TYPE/NO.	FLIGHT TIME	GRADE
		C-23A/		

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. TAKEOFF, IP DEMO AND FTE/N DATA COLLECTION (MTOP)
5. CHECK CLIMB, IP DEMO (4-8K, MRP/1400 PRPM)
6. TRIM SHOT, IP DEMO (8K, 125 KIAS)
7. LEVEL ACCELERATION, IP DEMO (8K, $1.1V_s - V_{max}$, MRP/1400 PRPM)
8. LEVEL DECEL, IP DEMO (8K, $V_{max} - 1.1V_s$, IDLE)
9. LEVEL ACCEL/DECEL, STUDENT PRACTICE (REPEAT ITEMS 7 & 8)
10. LOADED LEVEL ACCEL, IP DEMO (8K, $1.1V_s - P_s=0$, 1.4g, MRP/1400 PRPM)
11. LOADED LEVEL DECEL, IP DEMO (8K, $P_s = 0 - 1.1V_s$, 1.4g, FLT IDLE)
12. SAWTOOTH CLIMB, IP DEMO (7.5-8.5K, 105 KIAS, MRP/1400 PRPM)
13. TRIM SHOT, STUDENT PRACTICE (8K, 130 KIAS)
14. STABILIZED TURN, IP DEMO
    A. STABILIZED G TECHNIQUE (8K, 1.2, 1.4, AND 2.0g, MRP/1400 PRPM)
    B. CONSTANT AIRSPEED TECHNIQUE (8K, 120 KIAS, TORQUE FOR 130 KIAS + 250 LB-FT)
15. STABILIZED LOAD FACTOR TURNS, STUDENT PRACTICE (8K, 1.2, 1.4, 2.0g, TORQUE FOR 130 KIAS + 250 LB-FT)
16. TIMED TURN W/STABILIZED AIRSPEED, STUDENT PRACTICE (8K, 125, 115 KIAS, TORQUE FOR 130 KIAS + 250 LB-FT)
17. LONG RANGE DESCENT, STUDENT PRACTICE (8-5K, 150 KIAS, 400 FPM, 1200 PRPM)
18. ILS APPROACH, IP DEMO
19. GROUND BLOCK (PERFORMANCE)
20. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT LATPMD94.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

STUDENT	INSTRUCTOR	MISSION LEVEL ACCEL/TURN PERF DEMO (FTE/N) - IN SEAT	CLASS	DATE
		AIRCRAFT TYPE/NO. C-23A/	FLIGHT TIME	GRADE

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. TAKEOFF, IP DEMO AND FTE/N DATA COLLECTION (MTOP)
5. CHECK CLIMB, IP DEMO (4-8K, MRP/1400 PRPM)
6. TRIM SHOT, IP DEMO (8K, 125 KIAS)
7. LEVEL ACCELERATION, IP DEMO (8K, $1.1V_s$ - V_{max}, MRP/1400 PRPM)
8. LEVEL DECEL, IP DEMO (8K, V_{max} - $1.1V_s$, IDLE)
9. LEVEL ACCEL/DECEL, STUDENT PRACTICE (REPEAT ITEMS 7 & 8)
10. LOADED LEVEL ACCEL, IP DEMO (8K, $1.1V_s$ - P_s=0, 1.4g, MRP/1400 PRPM)
11. LOADED LEVEL DECEL, IP DEMO (8K, P_s = 0 - $1.1V_s$, 1.4g, FLT IDLE)
12. SAWTOOTH CLIMB, IP DEMO (7.5-8.5K, 105 KIAS, MRP/1400 PRPM)
13. TRIM SHOT, STUDENT PRACTICE (8K, 130 KIAS)
14. STABILIZED TURN, IP DEMO
    A. STABILIZED G TECHNIQUE (8K, 1.2, 1.4, AND 2.0g, MRP/1400 PRPM)
    B. CONSTANT AIRSPEED TECHNIQUE (8K, 120 KIAS, TORQUE FOR 130 KIAS + 250 LB-FT)
15. STABILIZED LOAD FACTOR TURNS, STUDENT PRACTICE (8K, 1.2, 1.4, 2.0g, TORQUE FOR 130 KIAS + 250 LB-FT)
16. TIMED TURN W/STABILIZED AIRSPEED, STUDENT PRACTICE (8K, 125, 115 KIAS, TORQUE FOR 130 KIAS + 250 LB-FT)
17. LONG RANGE DESCENT, STUDENT PRACTICE (8-5K, 150 KIAS, 400 FPM, 1200 PRPM)
18. ILS APPROACH, IP DEMO
19. GROUND BLOCK (PERFORMANCE)
20. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT LATPIS94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION LEVEL ACCEL/SAWTOOTH CLIMB DEMO (PILOT)	CLASS	DATE	
STUDENT	INSTRUCTOR		
AIRCRAFT TYPE/NO. T-38A/	FLIGHT TIME	GRADE	

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. MAX POWER TAKEOFF AND DATA COLLECTION
5. MIL POWER CHECK CLIMB (5-20K)
6. TRIM SHOT, IP DEMO (25K, 220 KIAS)
7. MIL POWER LEVEL ACCEL, IP DEMO (25K, 230 KIAS-0.9M)
8. MIL POWER LOADED DECEL, IP DEMO (25K, 3g, 0.9M - MODERATE BUFFET)
9. MIL POWER LEVEL ACCEL, STUDENT PRACTICE (25K, 230 KIAS - V_{max})
10. MIL POWER LOADED DECEL, STUDENT PRACTICE (25K, 3g, V_{max} - MODERATE BUFFET)
11. SAWTOOTH CLIMB, IP DEMO (25K, 225 KIAS)
12. SAWTOOTH CLIMB, STUDENT PRACTICE (25K, 200, 250, 275 KIAS)
13. TRIM SHOT, STUDENT PRACTICE (30K, 0.85M)
14. MAX POWER LEVEL ACCEL, STUDENT PRACTICE (30K, 0.85-1.1M)
15. MAX POWER LOADED DECEL, STUDENT PRACTICE (30K, 1.1-0.9M, 4g)
16. HIGH SPEED DESCENT, STUDENT PRACTICE (30-10K, 0.84 M, IDLE, SB)
17. TRIM SHOT, STUDENT PRACTICE (10K, 200 KIAS)
18. MIL POWER LEVEL ACCEL, STUDENT PRACTICE (12K, 220 KIAS - V_{max})
19. MIL POWER LOADED DECEL, STUDENT PRACTICE (12K, 3g, V_{max} - P_s = 0; THEN IDLE 2g TO MODERATE BUFFET)
20. MIL POWER LOADED ACCEL, STUDENT PRACTICE (12K, 2g, 270 KIAS - P_s = 0)
21. SPOT LANDING (±3 KIAS, ±300 FT)
22. GROUND BLOCK (PERFORMANCE)
23. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT LASCDP94.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
TURN PERF/CK CLIMB/CK DESCENT DEMO (PILOT)		

STUDENT	INSTRUCTOR

AIRCRAFT TYPE/NO.	FLIGHT TIME	GRADE
F-16B/		

MISSION EVENTS
1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. MIL POWER TAKEOFF, STUDENT PRACTICE
5. MIL POWER CHECK CLIMB, IP DEMO (5-20K)
6. PENETRATION CHECK DESCENT, IP DEMO (20-14K, 300 KCAS, 70%, SB)
7. MAX RANGE CHECK DESCENT, IP DEMO (12-6K, 210 KCAS, IDLE, CLEAN)
8. MIL POWER CHECK CLIMB, STUDENT PRACTICE (5-30K)
9. PENETRATION CHECK DESCENT, STUDENT PRACTICE (30-23K, 300 KCAS, 70%, SB)
10. TRIM SHOT, STUDENT PRACTICE (25K, 350 KCAS)
11. MIL POWER STABILIZED TURN, IP DEMO
A. STABILIZED AIRSPEED (25K, 350 KCAS)
B. STABILIZED LOAD FACTOR (25K, 1.5, 2.0g)
12. MIL POWER STABILIZED TURN, STUDENT PRACTICE
A. STABILIZED AIRSPEED (25K, 250, 300 KCAS)
B. STABILIZED LOAD FACTOR (25K, 1.5, 2.0, 3.0g)
13. MAX POWER STABILIZED TURN, STUDENT PRACTICE (25K, 350 KCAS)
14. MIL POWER STABILIZED TURNS, STUDENT PRACTICE (20K, 2.0, 2.5, 3.0g AND 230, 300, 370 KCAS, TIME TURNS AT 230 AND 300 KCAS)
15. SPEED BRAKES-IN PENETRATION CHECK DESCENT, STUDENT PRACTICE (25-15K, 300 KCAS, 70%, CLEAN)
16. MAX RANGE CHECK DESCENT, STUDENT PRACTICE (14-7K, 210 KCAS, IDLE, CLEAN)
17. SPOT LANDING (±3 KCAS, ±500 FT)
18. GROUND BLOCK (PERFORMANCE)
19. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT TPCCCD94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADE SHEET

STUDENT	INSTRUCTOR	MISSION AERODYNAMIC MODELING DEMO (PILOT)	CLASS	DATE
		AIRCRAFT TYPE/NO. T-38A/	FLIGHT TIME	GRADE

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. MAX POWER TAKEOFF
5. MIL POWER CHECK CLIMB, STUDENT PRACTICE (5-25K)
6. TRIM SHOT, STUDENT PRACTICE (25K, 0.8M)
7. STABILIZED METHODS, IP DEMO
   A. CONSTANT ALTITUDE (25K, 0.8M, 1.0, 2.0, 3.0g)
   B. DESCENDING TURN (25K, 0.8M, 1.0, 2.0, 3.0, 3.5g)
8. STABILIZED METHODS, STUDENT PRACTICE (AS PER ITEM #7)
9. DYNAMIC METHODS, IP DEMO
   A. ROLLER COASTER (25K, 0.8M)
   B. WIND-UP TURN (26-24K, 0.8M, 1.0-4.0g)
   C. SPLIT S (26-24K, 0.8M)
10. DYNAMIC METHODS, STUDENT PRACTICE (AS PER ITEM #9)
11. DYNAMIC METHODS, STUDENT PRACTICE (30K, 1.05M)
12. SPOT LANDING (±3 KIAS, ±300 FT)
13. GROUND BLOCK (PERFORMANCE)
14. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT AEROMD94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
PERFORMANCE DEMO (FTE/N)		

STUDENT	INSTRUCTOR	AIRCRAFT TYPE/NO.	FLIGHT TIME	GRADE
		T-38/		

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. INSTRUMENTATION PREFLIGHT/PROCEDURES
4. PREFLIGHT/GROUND BLOCK (PERFORMANCE)
5. MAX POWER TAKEOFF, IP DEMO
6. CHECK CLIMB
   A. MAXIMUM POWER, IP DEMO
   *B. MILITARY POWER, IP DEMO AND STUDENT PRACTICE
7. *TRIM SHOTS, IP DEMO AND STUDENT PRACTICE
8. *LEVEL ACCELERATIONS/DECELERATIONS, IP DEMO AND STUDENT PRACTICE
9. MIL POWER LOADED ACCEL (250 KIAS - 0.9M, 2g)
   MIL POWER LOADED DECEL (0.9M - V_{min}, 4g)
10. *TURN PERFORMANCE, IP DEMO AND STUDENT PRACTICE
11. *CHECK DESCENT, IP DEMO AND STUDENT PRACTICE
    A. MAXIMUM RANGE
    B. PENETRATION
12. *SAWTOOTH CLIMBS, IP DEMO AND STUDENT PRACTICE
13. *AERODYNAMIC MODELING, IP DEMO AND STUDENT PRACTICE
    A. STABILIZED METHODS (CONSTANT ALTITUDE/DESCENDING TURN)
    B. DYNAMIC METHODS (ROLLER COASTER/WINDUP TURN/SPLIT-S)
14. LOW L/D APPROACH (SHUTTLE AND/OR LIFTING BODY)
15. TOWER FLYBY (OPTIONAL)
16. LANDING
16. POST FLIGHT/GROUND BLOCK
17. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT PDFTEN94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

STUDENT	INSTRUCTOR	MISSION PERFORMANCE MIDPHASE CHECKRIDE (PILOT)	CLASS	DATE
		AIRCRAFT TYPE/NO. F-15B/	FLIGHT TIME	GRADE

MISSION EVENTS	
1. MISSION PREPARATION	
2. BRIEFING	
3. GROUND BLOCK (PERFORMANCE)	
4. MIL POWER TAKEOFF	3%
5. MIL CHECK CLIMB (5-20K)	4%
6. PENETRATION DESCENT (20-10K, 300 KIAS, 72%, SB)	3%
7. MAX CHECK CLIMB (5-30K)	6%
8. TRIM SHOT (35K, 300 KIAS)	3%
9. MAX 1g LEVEL ACCEL (35K, 0.9-1.3M)	8%
10. MIL 4g LEVEL DECEL (35K, 1.3-0.8M)	8%
11. HIGH SPEED DESCENT (30-15K, 0.8M, IDLE, SB)	4%
12. MIL 2g LEVEL ACCEL (23K, 250 KIAS - 0.85M)	5%
13. IDLE 3g LEVEL DECEL (23K, 0.85M - 250 KIAS)	5%
14. MAX RANGE DESCENT (20-10K, 220 KIAS, IDLE, CLEAN)	3%
15. TRIM SHOT (10K, 21 AOA, PA, SB)	3%
16. MIL 4G TURN PERFORMANCE (18K)	5%
17. MIL 250 KIAS TURN PERFORMANCE (18K)	5%
18. TOWER FLYBY (180 KIAS, PA)	3%
19. TOWER FLYBY (350 KIAS, CR)	3%
20. SPOT LANDING (±3 KIAS, ±300 FT)	4%
21. GROUND BLOCK (PERFORMANCE)	
22. DEBRIEFING	
PREPARATION, BRIEFING, GROUND BLOCKS, DEBRIEFING	5%
OVERALL PERFORMANCE MISSION	20%

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT PMCF1594.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
ALTERNATE PERFORMANCE MIDPHASE (PILOT)		
AIRCRAFT TYPE/NO. T-38A/	FLIGHT TIME	GRADE

STUDENT	INSTRUCTOR

MISSION EVENTS	
1. MISSION PREPARATION	
2. BRIEFING	
3. GROUND BLOCK (PERFORMANCE)	
4. MAX TAKEOFF	3%
5. MIL CHECK CLIMB (5-20K)	8%
6. PENETRATION DESCENT (20-10K, 300 KIAS, 80%, SB)	3%
7. MAX CHECK CLIMB (5-30K)	6%
8. TRIM SHOT (35K, 300 KIAS)	3%
9. MAX 1g LEVEL ACCEL (35K, 250 KIAS - 1.1M)	10%
10. MIL 4g LEVEL DECEL (35K, 1.1-0.9M)	6%
11. HIGH SPEED DESCENT (30-15K, 0.84M, IDLE, SB)	4%
12. MIL 2g LEVEL ACCEL (20K, 300 KIAS - 0.9M)	5%
13. MIL 3g LEVEL DECEL (20K, 0.9 MACH - P_s=0, IDLE TO V_{min})	5%
14. MAX RANGE DESCENT (20-10K, 240 KIAS, IDLE, CLEAN)	3%
15. TRIM SHOT (10K, 180 KIAS)	4%
16. MIL 1G LEVEL ACCEL (10K, 200 KIAS - 0.9M)	6%
17. TOWER FLYBY (180 KIAS, PA)	5%
18. SPOT LANDING (±3 KIAS, ±300 FT)	4%
19. GROUND BLOCK (PERFORMANCE)	
20. DEBRIEFING	
PREPARATION, BRIEFING, GROUND BLOCKS, DEBRIEFING	5%
OVERALL PERFORMANCE MISSION	20%

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT PMCT3894.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

STUDENT	INSTRUCTOR

MISSION	CLASS	DATE
PERF FINAL DEMO (PILOT, FTE/N)		

AIRCRAFT TYPE/NO.	FLIGHT TIME	GRADE
C-23A/		

MISSION EVENTS
1. MISSION PREPARATION
1. BRIEFING
3. GROUND BLOCK (PERFORMANCE)
4. TAKEOFF AND DATA COLLECTION (4° FLAP, MTOP)
5. CHECK CLIMB, STUDENT PRACTICE (4-10K, MRP/1400 PRPM)
6. CRUISE DATA, STUDENT PRACTICE (10K, MAX ENDURANCE AND LONG RANGE AIRSPEEDS, 1400 PRPM)
7. TRIM SHOT, STUDENT PRACTICE (10K, 120 KIAS)
8. TIMED TURN, STUDENT PRACTICE (10K, 120 KIAS, TORQUE FOR 130 KIAS + 250 LB FT)
9. CHECK DESCENT, STUDENT PRACTICE (10-7K, LONG RANGE DESCENT)
10. LEVEL ACCEL, STUDENT PRACTICE (8K, $1.1V_s - V_{max}$, MRP/1400 PRPM)
11. SAWTOOTH CLIMBS, STUDENT PRACTICE (8K, MRP/1400 PRPM)
12. LOADED ACCEL/DECEL, STUDENT PRACTICE (8K, $1.1V_s - V_{max} - 1.1V_s$, 1.4g, MRP/1400 PRPM-IDLE)
13. SPEED COURSE PRACTICE, STUDENT PRACTICE (130 KIAS, ALTERNATE: TOWER FLYBY)
14. TRAFFIC PATTERNS AND LANDINGS, IP DEMO AND STUDENT PRACTICE
15. GROUND BLOCK (PERFORMANCE)
16. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT PFDC2394.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
PERFORMANCE FTT FINAL (PILOT)		

STUDENT	INSTRUCTOR

AIRCRAFT TYPE/NO.	FLIGHT TIME	GRADE
C-130 A, B, E, OR H		

MISSION EVENTS	GRADE
1. MISSION PREPARATION	2%
2. BRIEFING	2%
3. GROUND BLOCK (PERFORMANCE)	1%
4. TAKEOFF AND DATA COLLECTION	2%
5. CHECK CLIMB (10K BAND, FLT MANUAL SCHEDULE AIRSPEED, CLIMB TIT, CR CONFIGURATION)	10%
6. CRUISE DATA (120, 220 KIAS)	10%
7. SAWTOOTH CLIMBS (CRITICAL ENGINE FEATHERED, ASSIGNED CONFIGURATION)	10%
8. MAXIMUM RANGE DESCENT (5K BAND, FLIGHT MANUAL SCHEDULE AIRSPEED, CR CONFIGURATION)	5%
9. TURN PERFORMANCE (TORQUE FOR 180 KIAS + 1000 IN-LB)	10%
10. LEVEL ACCEL ($1.1V_s$ - V_{max})	10%
11. LOADED ACCEL ($1.1V_s$ - V_{max})	8%
12. LOADED DECEL (V_{max} - $1.1V_s$, IDLE)	8%
13. TOWER FLYBY (CR CONFIGURATION)	2%
14. LANDING	1%
15. GROUND BLOCK (PERFORMANCE)	1%
16. DEBRIEFING	3%
17. OVERALL PERFORMANCE	15%

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT PFFPIL94.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION	CLASS	DATE
PERFORMANCE FTT FINAL (FTE/N)		
AIRCRAFT TYPE/NO. C-130 A, B, E OR H/	FLIGHT TIME	GRADE

STUDENT	INSTRUCTOR

MISSION EVENTS		
FLIGHT GRADE		
1. MISSION PREPARATION		15%
MISSION DEFINITION		
TEST OBJECTIVES DEFINITION		
TEST ENVELOPE DEFINITION		
FUEL CONSIDERATIONS		
AREA CONSIDERATIONS		
2. MISSION BRIEFING/DEBRIEFING		15%
SPECIFIC MISSION BRIEFING/DEBRIEFING		
3. DATA CARDS		5%
LEGIBLE		
COMPREHENSIVE		
CONCISE		
4. AIRBORNE CONDUCT		65%
GROUND BLOCKS (2)	TURN PERFORMANCE (6)	
TAKEOFF (2)	1.4g LEVEL ACCEL (4)	
CHECK CLIMB (6)	1.4g LEVEL DECEL (4)	
CRUISE (6)	LEVEL ACCEL (6)	
DESCENT (3)	TOWER FLYBY (2)	
SAWTOOTHS (6)		
IN-FLIGHT DECISIONS		
DELIBERATE ACTION TO CONTROL TEST (5)		
ABILITY TO ADAPT TO CHANGES (4)		
SHOW EVIDENCE OF PRIORITIES (4)		
TIME, FUEL, ENERGY MANAGEMENT (5)		
REPORT GRADE		
5. ORAL REPORT	25 POINTS	

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT PFFFTE94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION LOW L/D DEMO (PILOT)	CLASS	DATE
AIRCRAFT TYPE/NO. T-38/	FLIGHT TIME	GRADE

STUDENT	INSTRUCTOR

MISSION EVENTS

1. MISSION PREPARATION
2. BRIEFING
3. TAKEOFF/CLIMB TO ENTRY ALTITUDE
4. PATTERN 1 (NOMINAL X-24B PATTERN), IP DEMO
5. PATTERN 2 (NOMINAL X-24B PATTERN), STUDENT PRACTICE
6. PATTERN 3 (HIGH ENTRY X-24B PATTERN), STUDENT PRACTICE
7. PATTERN 4 (LOW ENTRY X-24B PATTERN), STUDENT PRACTICE
8. PATTERN 5 (SHUTTLE APPROACH), IP DEMO
9. PATTERN 6 (SHUTTLE APPROACH), STUDENT PRACTICE
10. PATTERN 7 (SHUTTLE APPROACH), STUDENT PRACTICE
11. CLOSED PATTERN/LANDING
12. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT LOWLDP94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

MISSION GLIDER CHECKOUT (PILOT)	CLASS		DATE
STUDENT	INSTRUCTOR		
AIRCRAFT TYPE/NO. SGS 2-33/1-26/	FLIGHT TIME		GRADE

MISSION EVENTS	
FLIGHT 1 - SGS 2-33	(20)
TAKEOFF, 3000 FT TOW, BOX WASH,	
AIRSPEED CONTROL, STALLS,	
COORDINATED TURNS, SIDESLIPS, SPIRAL TURNS,	
PATTERN, LANDING	
FLIGHT 2 - SGS 2-33	(10)
PATTERN TOW (1000 FT), PATTERN, LANDING	
FLIGHT 3 - SGS 2-33	(5)
SIM ROPE BREAK 200-500 FT, LANDING	
FLIGHT 4 - SGS 2-33 SOLO	(20)
2500 FT TOW,	
COORDINATED TURNS, SIDESLIPS,	
PATTERN, LANDING	
FLIGHT 5 - SGS 1-26 SOLO	(30)
3000 FT TOW,	
COORDINATED TURNS, STEEP TURNS,	
STALLS, SIDESLIPS,	
PATTERN, LANDING	
I CERTIFY THAT I HAVE GIVEN THE STUDENT NAMED ABOVE GROUND AND FLIGHT INSTRUCTION AS PER FAR 61.87(A)-(D) AND (H) (1)-(8), AND FIND HIM/HER COMPETENT TO SOLO THE SGS 2-33 AND SGS 1-26. THIS CLEARANCE EXPIRES IN 90 DAYS.	
CFIG #	
EXP DATE	
SIGNATURE	
NOTE: NUMBER IN PARENTHESES IS APPROXIMATE LENGTH OF TIME IN MINUTES FOR EACH FLIGHT.	

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED. USAF TPS/ED OVERPRINT GCOPIL94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

STUDENT	INSTRUCTOR	MISSION GLIDER DEMO (FTE/N)	CLASS	DATE
		AIRCRAFT TYPE/NO. SGS 2-33/L-13/	FLIGHT TIME	GRADE

MISSION EVENTS

FLIGHT 1 2-33 - TAKEOFF, 3000' TOW, RELEASE, (20)
DEMO STALLS, PRACTICE TURNS AND AIRSPEED CONTROL,
DEMO PATTERN AND LANDING

FLIGHT 2 L-13 - TAKEOFF, 3000' TOW, BOX WASH, RELEASE, (20)
TURNS, DEMO PATTERN AND LANDING

NOTE: NUMBER IN PARENTHESES IS APPROXIMATE LENGTH OF TIME IN MINUTES FOR EACH FLIGHT.

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT GDFTEN94.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADE SHEET

STUDENT	INSTRUCTOR	MISSION PROPULSION DEMO (PILOT)	CLASS	DATE
		AIRCRAFT TYPE/NO. F-15B/	FLIGHT TIME	GRADE

MISSION EVENTS
1. MISSION PREPARATION
2. ENGINE START
3. LINEUP CHECK TRANSIENT
4. FLIGHT MANUAL TAKEOFF
5. MILITARY POWER CLIMB
6. MILITARY POWER LEVEL ACCELERATION (10K, 0.4-0.9M, 10K)
7. MAXIMUM POWER CLIMB (25-38K, 0.7M)
8. SUPERSONIC THROTTLE TRANSIENT (35K, 1.3M)
9. HIGH ALTITUDE THROTTLE TRANSIENT (50K, 300 KCAS)
10. NON-MANEUVERING THROTTLE TRANSIENTS (30K, 0.8M),
IP DEMO, STUDENT PRACTICE
A. MIL-IDLE-MIL
B. MIL-IDLE+5%-MAX
C. MAX-IDLE
11. MANEUVERING THROTTLE TRANSIENTS (25K, 0.8M),
IP DEMO, STUDENT PRACTICE
A. IDLE-MAX (21 UNITS AOA)
B. IDLE-MAX (LIMIT AOS)
C. IDLE-MAX (-1 g)
12. LUBRICATION SYSTEM CHECK (20K, 350 KCAS)
13. LOW SPEED TRANSIENT (15K, 130 KCAS, OPTIONAL)
14. AIRSTARTS (25K, 300 KCAS)
A. 40% RPM
B. 25% RPM
15. RECOVERY/LANDING (OVERHEAD PRECAUTIONARY APPROACH)
16. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT PROPUL94.GRS, JAN 94

ADDITIONAL COMMENTS

USAF TEST PILOT SCHOOL
STUDENT MISSION CARD/GRADESHEET

STUDENT	INSTRUCTOR	MISSION C-141 PERFORMANCE DEMO (PILOT, FTE/N)	CLASS	DATE
		AIRCRAFT TYPE/NO. C-141A/	FLIGHT TIME	GRADE

MISSION EVENTS
1. MISSION PREPARATION
2. BRIEFING
3. PREFLIGHT/START/TAXI
4. GROUND BLOCK
5. TAKEOFF
6. NRT CHECK CLIMB
7. TRIM SHOT
8. MRT LEVEL ACCELERATION
9. SPOILER OPERATION
10. AERODYNAMIC MODELING
A. CONSTANT ALTITUDE (0°, 30°, 45° BANK)
B. ROLLER COASTER
11. 3-ENGINE MRT SAWTOOTH CLIMB
12. PENETRATION DESCENT
13. TOWER FLYBY
14. TOUCH AND GO/FULL STOP LANDING
15. GROUND BLOCK
16. DEBRIEFING

Comment on the following areas. (Expand on any area that is particularly strong or below average/unsatisfactory.) Continue on reverse side if necessary.

MISSION PREPARATION

FLIGHT TEST TECHNIQUES/DATA PROCEDURES/AIRCRAFT HANDLING

AIRMANSHIP (PLANNING/SAFETY/PROCEDURAL KNOWLEDGE)

INSTRUCTOR	SECTION CHIEF	CHIEF, OPERATIONS BR

AFSC FORM 5228a, OCT 86 REPLACES AFFTC FORM 255, NOV 84, WHICH WILL BE USED.

USAF TPS/ED OVERPRINT C141PD94.GRS, JAN 94

ADDITIONAL COMMENTS

AFSC FORM 5228a *(Reverse)*, OCT 86

APPENDIX B
SAFETY REVIEW BOARD DOCUMENTATION

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TEST PROJECT SAFETY REVIEW

I. SAFETY REVIEW REQUEST

PROJECT TEST TITLE	PROJECT JON	PERFORMING AGENCY	
USAF Test Pilot School Performance Phase	996 TPS	USAF Test Pilot School	

PROJECT MANAGER (Typed Name and Grade)	SIGNATURE	PHONE NUMBER	DATE
Thomas E. Kana, Major	Kana	7-2348	30 Jul 92
UNIT SSO (Typed Name and Grade)	**SIGNATURE**	**PHONE NUMBER**	**DATE**
Michael R. Green, Major	Michael R. G	7-8038	30 Jul 92

II. SAFETY REVIEW BOARD ACTION

TEST STARTING DATE	TEST COMPLETION DATE	RISK LEVEL	CONTROL NUMBER
10 Aug 92	10 Aug 95	LOW	92-38

III. SAFETY BOARD MEMBERS

NAME, GRADE AND TITLE	SIGNATURE	NAME, GRADE AND TITLE	SIGNATURE
Moser, Craig, Lt Col AFFTC/SET	Craig S Moser 1 Sep 92		
Olson, Wayne, GS-13 6510TW/DUEF	Wayne M. Olson 1 Sep 92		
Caterina, Vince, Maj 6516TS/DOA	Vincent Caterina 2 Sep 92		

IV. BRIEF DESCRIPTION AND JUSTIFICATION OF TEST *(Use Additional Sheets of Plain Bond Paper if Needed)*

The performance phase of instruction is part of formal training provided by the USAF Test Pilot School. The phase objective is to teach student test pilots, navigators, and flight test engineers the basic principles and techniques used in performance flight testing of aircraft. This testing primarily involves determining an aircraft's energy gaining and losing capabilities. Performance flight testing techniques are taught in T-38, F-15, F-16, C-23, KC-135, C-130, glider and C-141 aircraft using procedures established in the <u>Performance Phase Planning Guide</u>. Following this training, students evaluate their designated group aircraft at conditions listed in the respective <u>Limited Performance Evaluation Test Plan</u>.

V. FINAL COORDINATION AND APPROVAL

TYPED NAME, GRADE AND TITLE (COORDINATING OFFICIAL)	SIGNATURE	DATE	CONCUR YES	CONCUR NO	COMMENTS ADDED YES	COMMENTS ADDED NO
H.T. Strittmatter, Col Commandant, USAF TPS	Harold T. Strittmatter	31 AUG 92	✓			✓
TEST WING DEPUTY COMMANDER FOR OPERATIONS	[illegible]	4 Sep 92	✓			✓
6510 TEST WING COMMANDER APPROVE	[illegible]	13 Sep	✓			✓
AFFTC DIRECTOR OF SAFETY COORD.	[illegible] White	3 Sep 92	✓		✓	
AFFTC VICE COMMANDER INFO.	[illegible]	15 Sep 92	✓			—
~~SIGNATURE OF AFFTC COMMANDER~~			APPROVED ☐ DISAPPROVED ☐			

AFSC FORM 5028, SEP 89 — PREVIOUS EDITION IS OBSOLETE.

VI.	REMARKS *(To Be Completed By AFFTC/SES)*

1. BACKGROUND. A Safety Review Board (SRB) was convened on 24 July 1992 at the Safety Conference Room to review TPS Performance Phase safety planning. A TPS curriculum review of the Phase Plan determined it to be technically sound. (See Tab 3) A list of the SRB attendees is included in attachment 1.

2. MISHAP RESPONSIBILITIES. The T-38, F-15, F-16, and C-23 test aircraft for the Performance Phase are possessed by AFFTC, and the KC-135 and C-141 will be owned by AFFTC by the time these aircraft will be used in the performance phase. AFFTC has mishap investigation and reporting responsibilities. AFMC has mishap accountability. Gliders are operated under contract. Mishap investigation and reporting are the responsibility of the FAA. The gliderport under contract has mishap accountability. C-130 aircraft mishap investigation, reporting, and accountability are the responsibility of the providing unit IAW AFR 127-4.

3. GENERAL MINIMIZING CONSIDERATIONS. In addition to the specific corrective actions and minimizing procedures listed in the AFMC Forms 5028a, Test Hazard Analysis, the following general minimizing considerations were discussed by the SRB.

a) General Procedures

1) All testing will be accomplished under the direct supervision of the USAFTPS staff. Student test cards will be reviewed and approved by an IP prior to flight IAW USAFTPS OI 51-10.

(continued)

VII. AMENDMENTS *(Date)*

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
11.	12.	13.	14.	15.
16.	17.	18.	19.	20.

VIII. REFERENCES

1. Performance Phase Planning Guide, USAFTPS, Edwards AFB, Ca., current.
2. F-16 Limited Performance Evaluation, Curriculum Test Plan, USAFTPS, Edwards AFB, Ca., current.
3. T-38A Limited Performance Evaluation, Curriculum Test Plan, USAFTPS, Edwards AFB, Ca., current.
4. C-23 Limited Performance Evaluation, Curriculum Test Plan, USAFTPS, Edwards AFB, Ca., current.
5. Performance Phase Safety Plan, USAFTPS, Edwards AFB, CA., March, 1989.

SECTION IV (Continued)

Approximately 26 different types of sorties are contained in the performance phase. In addition, aircraft checkout sorties (reviewed under SRB #91-45, 16 Oct 91) in the assigned data group aircraft are accomplished at the beginning of the phase, which qualify the student test pilots for day, VFR-only operations. Flying in all other aircraft types requires a TPS IP onboard.

The last formal safety review of the complete TPS Performance Phase occurred in 1989.

SECTION VI (Continued)

2) All data sorties will be flown with a minimum of 2 crewmembers.

3) All TPS IPs must be current in performance testing, and receive applicable performance FTT briefings (every 6 months) prior to instructing students.

4) All performance phase flying will be conducted IAW applicable aircraft Flight Manual's, AFFTC Regulation 55-2, and applicable USAFTPS aircraft guides.

5) Changes to the Performance Phase Planning Guide or to the Performance Test Plans require approval of the TPS Commandant. The TPS Commandant will determine which changes warrant coordination/approval from AFFTC/SEF. Major changes to the Phase Planning Guide or the Test Plans will be via AFMC Form 5028b.

6) Except for check climb entries, the low speed course, and tower flybys, no inflight testing will be performed below 3000 ft. AGL (except the C-23, which has a minimum testing altitude of 1500 ft. AGL). Check descent tests will be terminated to effect recovery at least 3000 ft. AGL (1500 ft. for C-23).

7) Testing will only be accomplished during day-VMC conditions.

8) Maximum sustained g-loading for testing will be 6 g's. EXCEPTION: Crewmembers who have attended official USAF centrifuge training may test up to 7 g's sustained. (Note: T-38 still uses a maximum of 6 g's for test purposes. The A-37 has a 5 g limit due to a lack of g-suit.)

9) On the F-15 propulsion demo, all loose items will be stowed prior to takeoff.

10) During the airstart portion of the F-15 propulsion profile, front cockpit pilots will not shut down any engine, start the JFS (if necessary), or engage the JFS without clearance from the IP.

b) T-38 Minimizing Procedures:

1) Minimum airspeed in the T-38 will be determined by moderate buffet.

2) T-38 cruise testing above FL250 will not be performed below 230 KIAS.

3) Above FL300, minimum afterburner initiation airspeed for the T-38 will be 250 KIAS, and will be accomplished one throttle at a time.

4) On low L/D sorties, the landing gear must be raised or lowered (and locked) below 240 KIAS, but the landing gear down and locked maximum airspeed is extended to 300 KIAS.

5) On low L/D sorties, the IP will pull the position light circuit breaker (after confirming the front cockpit pilot has turned the position light switch off) prior to any approaches and will reset it upon completion of all L/D approaches.

c) C-23 Minimizing Procedures:

1) Use of onboard oxygen systems will be required on all tests conducted above 10000 ft. MSL.

2) No inflight testing will be conducted above FL180.

3) Minimum intentional test point airspeed will be 1.1 V_s, with absolute minimum airspeed being that of the stall warning horn/stick shaker activation.

d) F-15/F-16 Minimizing Procedures:

1) The aircraft will not be operated in region 3 of the engine envelope.

2) Afterburner initiation will only occur in region 1 of the engine envelope.

3) Minimum airspeed on all data sorties will be that airspeed equating to on speed final approach AOA based on the aircraft's weight and configuration.

4. TEST ARTICLE RESTRICTIONS. None.

5. SPECIAL CONSIDERATIONS. None.

6. ACTION ITEMS.

1) Considerations were raised concerning aircraft proximity to the ground during F-16 level accelerations at 5500 ft MSL in maximum power. That particular test point was eliminated, leaving the lowest altitude test point for the F-16 at 10000 ft MSL.

STATUS: Item closed.

2) Concerns about minimum altitudes for three engine testing on the C-130 aircraft were raised. IAW AFR 60-16, minimum altitude for engine shutdown through restart is 5000 ft AGL. Unless MAJCOM restrictions require higher ground clearances, minimum altitude will be 5000 ft AGL.

STATUS: Item closed.

3) Concerns about altitude loss during the F-16 Mach 1.1 split-s maneuver were raised. A curriculum development sortie for aerodynamic modeling will be scheduled to investigate altitude loss for the planned aircraft configurations that will be flown.

STATUS: Pending flight.

7. RISK ASSESSMENT. The SRB recommends that the Performance Phase of the TPS curriculum be considered LOW RISK. This risk assessment was based on a review of the Performance Phase Planning Guide, associated test plans, Test Hazard Analysis, and previous TPS experience.

8. COORDINATION COMMENTS.

AFFTC/SE Comment: Reference Section IV, para 3a(5) of this Form 5028, the TPS Commandant will base his determination on changes to safety planning. If there are no changes to safety planning, then no Form 5028b is required.

Rodrigo J. Huete

RODRIGO J. HUETE, Lt Col, USAF
Director of Safety

TES . AZARD ANALYSIS (THA)

TEST SERIES	PAGE OF PAGE / HAZ CAT/PROBABILITY
USAF Test Pilot School Performance Phase	I/Low
PREPARED BY (Type Name and Title): Richard L. Bennett, Major	SIGNATURE: Richard L. Bennett
UNIT SSO (Type Name and Grade): Michael R. Green, Major	SIGNATURE: Michael R. G

HAZARD: Ground Impact During Tower Flybys

CAUSE:
1. Pilot Inattention/Pilot Complacency
2. Visual Illusion/Misjudgment
3. Pilot Task Saturation

EFFECT: Death/Loss of Aircraft

MINIMIZING PROCEDURES:

1. (1,2,3) Minimum altitude for tower flybys is 50 feet AGL.
2. (1,2,3) Tower flyby operations will be planned at or above 100 feet AGL.
3. (1,2,3) A TPS IP will demonstrate proper tower flyby techniques to the student prior to student tower flyby data collection. A TPS student must have his/her gradebook endorsed for crew solo for tower flybys prior to accomplishing them without an IP on board.
4. (1,2,3) If available, a radar altimeter will be used to assist in altitude monitoring. Low altitude warnings will be set to a minimum of at least 50 feet.
5. (2) All patterns will be flown so as to roll out on final no lower than 200 feet AGL.
6. (2) Visual techniques to aid in achieving level flight conditions on final will be briefed for each sortie.

CORRECTIVE ACTION:

1. If any of the above listed causes are experienced, the crew will knock off the tower flyby run and climb to a safe altitude.

TES. .AZARD ANALYSIS (THA)	PAGE OF PAGES
TEST SERIES USAF Test Pilot School Performance Phase	HAZ CAT/PROBABILITY I/Low
PREPARED BY (Type Name and Title) Richard L. Bennett, Major	SIGNATURE Richard L. Bennett
UNIT SSO (Type Name and Grade) Michael R. Green, Major	SIGNATURE Michael R. Green

HAZARD: Ground Impact During Low L/D Approaches

CAUSE:
1. Pilot Inattention
2. Aimpoint Fixation
3. Poor Aimpoint/Airspeed Control
4. Flaring with Insufficient Energy
5. Excessive PIO During High Speed Flare
6. Task Saturation

EFFECT: Death/Loss of Aircraft

MINIMIZING PROCEDURES:

1. (1,2,4) Minimum altitude to initiate flare will be 3400 ft. MSL. A preflare call at 4400 ft. MSL will be made among crewmembers.
2. (3,4) Minimum flare airspeed will be 260 KIAS.
3. (3,4,6) Flight path corrections will not be made below 7000 ft. MSL. Final approach aimpoint and airspeed control techniques will be thoroughly briefed.
4. (5) Proper trim techniques will be briefed to prevent PIOs during the flare.
5. (2,3,6) All L/D sorties will be flown with a current L/D IP. TPS IPs will complete a front seat and rear seat checkout prior to flying L/D sorties. To maintain currency, a low L/D approach is required every 180 days.

CORRECTIVE ACTION:

1. If any of the above causes are experienced, the approach will be terminated and the aircraft leveled off.
2. If a PIO is experienced during the flare, the stick will be frozen in a neutral to slightly aft position to eliminate oscillations, and the aircraft will then be placed in a climb to a safe altitude.

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TEST HAZARD ANALYSIS (THA)	PAGE OF PAGES
TEST SERIES USAF Test Pilot School Performance Phase	HAZ CAT/PROBABILITY I/LOW
PREPARED BY (Type Name and Title) Thomas E. Kana, Maj	SIGNATURE T E Kana
UNIT SSO (Type Name and Grade) Michael R. Green, Maj	SIGNATURE Michael R. Green

HAZARD: Dual Engine Stall/Stagnation During Propulsion Demonstration 0.7M Maximum Power Climb.

CAUSE:

1. Inadvertent Rapid Throttle Transition While in Region 2 of the F100-PW-100 Afterburner Operating Envelope.
2. Excessive Airspeed Loss Due to Pilot Inattention Resulting in Entry into Region 3.
3. Inattention to Aircraft Altitude Resulting in Entry in Region 3 Operations.

EFFECT: Engine Damage, Possible Aircraft/Aircrew Loss

MINIMIZING PROCEDURES:

1. (3) If afterburner lock out does not occur before 38,000 ft MSL, the test point will be terminated and the aircraft recovered to level flight.
2. (1) The throttles will not be moved once the aircraft slows below 250 KCAS.
3. (2, 3) The test point will be terminated to preclude flight slower than 170 KCAS.

CORRECTIVE ACTION: In the event of an engine stall/stagnation, the aircrew will follow the appropriate single/dual engine stall/stagnation engine recovery procedures as outlined in Section 3 of the Flight Manual.

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TES. .AZARD ANALYSIS (THA)

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TEST SERIES	HAZ CAT/PROBABILITY
USAF Test Pilot School Performance Phase	I/LOW

PREPARED BY (Type Name and Title)	SIGNATURE
Thomas E. Kana, Maj	T E Kana
UNIT SSO (Type Name and Grade)	SIGNATURE
Michael R. Green, Maj	Michael R. Green

HAZARD: F-15 Dual Engine Failure during Propulsion Demonstration

CAUSE:
1. Mis-rigged Engines
2. Engines Stall/Stagnation

EFFECT: Loss of Aircraft/Aircrew

MINIMIZING PROCEDURES:

1. (1, 2) Rapid throttle transients are accomplished one engine at a time.
2. (1, 2) If any engine anomaly is observed while operating in Region 1 of the engine envelope, the mission will be terminated.
3. (1) Only one engine will be intentionally shutdown at any time.

CORRECTIVE ACTION: If dual engine failure occurs, restart procedures will be accomplished IAW the flight manual. Mission will be terminated.

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